MARINE REVIEW.

VOL. XI. CLEVELAND, O., FEBRUARY 28, 1895. No. 9.

Matters Pertaining to Freights.

Vessel brokers and iron ore shippers in Cleveland are in receipt of inquiries from other parts of the lakes relative to contracts for carrying ore during the coming season, but there is nothing more definite in the situation than there was immediately following the close of navigation. The ore shippers, who some time ago agreed to ask for a slight increase over last year's prices on Bessemer ores from the old ranges, are making no effort whatever to bring about sales, and if the whole truth of the agreement between them was made public it would probably be found that one feature of it referred to their remaining out of the market until such time as the furnace men have actually used up supplies of Bessemer now on dock and come into the market to meet immediate wants in the way of new supplies on a large scale. The consumption in furnaces using the Lake Superior product continues as heavy as it ever has been in the history of the iron trade, and orders for shipments from docks to furnaces have increased materially since mild weather set in, but supplies have not as yet been sufficiently reduced to cause the consumers to make any inquiry regarding next year's business.

Within the past few days the Carnegie company has been buying pig iron, its purchases being estimated at 80,000 tons or more. This move on the part of the big steel company has advanced prices about 25 cents a ton. It is looked upon as an effort to stock up in anticipation of labor troubles in the coke regions. Prices of pig iron have been exceedingly low, however, and it may be that the Carnegie management is satisfied that the lowest point has been reached.

Of course, the reported interview with President Curry of the Metropolitan Land and Iron Company, sent out from Milwaukee a few days ago, in which extreme disaster was predicted for all the old Lake Superior mining districts, on account of the Mesabi product, was looked upon as simply ridiculous by everybody acquainted with the mining industry.

Mr. Curry has found it necessary, however, to brand the matter as a falsehood of the worst kind, on account of the source from which it emanated. The Milwaukee paper in which the interview was originally published has explained that one of its editors was imposed upon in accepting the matter, and all other papers that printed it have also made denials.

Lake Builders and the Navy Appropriations.

The United States senate will finish consideration of appropriation bills this week, and it is now certain that the navy bill will provide for twelve torpedo boats, in addition to three battleships that will be paterned after the Iowa, the largest and most powerful of American ships of war. Aside from the general advancement in the ship building industry of the country resulting from the contracts for battleships that will be let in accordance with this bill, ship builders of the lakes are not directly interested in this legislation, but if they were not hampered by existing treaty relations between Great Britain and the United States regarding war vessels on the lakes, they would be heard from when bids are called for the construction of the twelve torpedo boats.

The readiness with which congress has supported the navy department in its efforts to keep apace with other naval powers in the matter of adding a strong fleet of torpedo vessels to the navy, should be proof to lake builders that the number of vessels of the torpedo type to be built in the next few years will be very large. All other countries possessing important navies are far ahead of the United States in this regard. Vesssels of this kind can be built on the lakes as readily as on the seaboard, and there is no doubt that in competition with seaboard builders the builders of the lakes would be found securing some of the contracts, as they have secured contracts for vessels of the light-house service. It is not probable that the necessary legislation can be had early enough to permit lake builders to bid on the twelve boats for which appropriations have been made, but it would seem that they are certainly neglecting a great opportunity for the future if they do not take immediate action in this matter upon the opening of the new congress.

Union Transit Line Deal.

Vessel owners interested in the package freight business have for some time past been discussing reports of negotiations between Messrs. John Gordon and Henry C. French of the Union Transit Company of Buffalo and M. A. Hanna & Co. and the Globe Iron Works Company of Cleveland for the lease of the six steel seamers of the Menominee Transit Company, which have been engaged in the ore trade since they were built for the Chapin Mining Company, when that corporation was controlled by Ferdinand Schlesinger of financial fame. It was reported from several quarters that these boats were to be fitted with gangways and machinery for handliug package freight and leased to the Union Transit Company, in which Mr. John Gordon is interested, and which has the advantage of close relations with the Erie railway. These reports are now put to rest with the announcement that the Union Transit Company has chartered five of the steamers of the Crescent Transportation Company of Detroit, viz., Nicol, Moran, Stevens, Ward and Fisk. Negotiations were opened up with the Menominee Transit Company for their six boats, but Messrs. Gordon and French were unwilling to do more than offer to operate the boats in the package freight business to the best possible advantage of owners and lessees. They would not charter them at a fixed price in which the owners could see a profit.

As a result of the arraugement with the Crescent line management, the Hodge, which is the only remaining steamer of that line, will be either sold or chartered, so that the Detroit company will go out of the transportation business altogether. The Crescent line has not paid a dividend for over four years, but on the contrary has contracted quite a heavy indebtedness, mainly on account of not having direct traffic arrangements with any of the railways. The Union Transit Company charters these steamers for a fixed sum out and out, and it is understood that there is a provision attached to the charter that the Union company may purchase the boats on appraisal, upon termination of the charter. The Crescent Transportation Company was established in 1892 on what was left of the Ward, Detroit & Lake Superior line. The Ward line was established about twelve years ago with the steamer Hodge. The Toledo was then purchased and ran in connection with the Hodge. Soon afterward the St. Paul was chartered and the Osceola built. The latter was wrecked and the company then successively built the Stevens, Ward, Moran and Nicol. In the meantime they had purchased the Fisk. The Union Transit Company owns the steamers Avon and Portage, and these with the five boats just chartered should make it a strong line in the package freight trade, if connections with the Erie Railway and Northern Transportation Company are to be of special advantage in furnishing business.

Lake Superior Mining Institute.

Secretary F. W. Denton of Soudan, Minn., announces that the third annual meeting of the Lake Superior Mining Institute will begin on Wednesday morning, March 6th, at Duluth, and end at the same place on Friday evening, March 8. Shortly after the arrival at Duluth of the Duluth, South Shore & Atlantic train from the east, on Wednesday morning, a train will convey the members to some point on the Mesabi range, probably to Virginia. From Virginia the party will work east on Thursday, arriving in Tower on Thursday evening. On Friday, visits will be paid to the mines of the Vermillion range at Soudan and Ely, and the party will be returned to Duluth the same evening. A detailed program will be issued later. Both the Duluth & Iron Range and the Duluth, Mesabi & Northern railways have promised special trains, so that there will be no delay in getting from place to place. Meetings for the reading and discussion of papers, and transaction of business, will be held in Virginia and Tower.

The two railroads traversing the iron ranges have kindly offered to transport the party free of charge, so that no railway fares will be collected during the circuit, which begins and ends in Duluth. The expenses of the members during the meeting therefore will be confined to hotel expenses. Efforts are being made to secure special rates over the D. S. S. & A. Ry., and members will be notified if the efforts succeed. In case, however, there should not be time to send out notices, members are advised to make inquiries about the matter when purchasing their tickets.

John Marron and others of Cleveland, who are endeavoring to secure capital for the construction of a line of steel barges, to engage in package freight business between Cleveland and New York, the boats to be of a kind suited to towing on Lake Erie as well as through the Erie canal, have formed a company under Ohio laws, to be known as the Cleveland Steel Canal Boat Company. The capital is placed at $175,000. No definite steps have as yet been taken towards building any of the barges, although the projectors of the scheme say they have money enough subscribed to begin construction.

Chicago Drainage Canal.

A CONCISE REPORT FROM THE TRUSTEES COVERING EXPENDITURES, METHOD AND PROGRESS OF WORK—CONTRACTS INVOLVING $21,000,000.

On Nov. 1st last, expenditures on the Chicago drainage canal amounted to a little more than $10,000,000, and the estimated cost of all work under contract was $21,354,074.04. As this immense outlay of money on the canal goes on, the importance of it from an engineering standpoint is being more fully realized, and the trustees in charge of the work, who are in receipt of numerous inquiries from all parts of the world for information regarding it, have just issued a concise report from which liberal extracts are made here. In order to understand the general scheme under which the organization known as the Sanitary District of Chicago is building this channel it is necessary to state that its existence is due to the law for incorporating sanitary districts, enacted by the legislature of the state of Illinois in 1889. The sanitary district of Chicago comprises all of the city north of eighty-seventh street, together with some forty-three square miles of Cook county, outside of the city limits, which will be directly benefitted by the improvement. The population of the district is about 1,750,000 and the assessed value of real estate and other property subject to taxation is about $250,000,000. The trustees are elected by popular vote and form an independent organization separate and distinct from the municipal government of Chicago. These trustees may levy and collect taxes for carrying on the work entrusted to them to the extent of one-half of one per cent. of the value of the taxable property within the corporate limits of the district. They may issue bonds to the extent of five par cent. of the value of the taxable property of the district, provided, however, that said 5 per cent. shall not exceed the sum of $15,000,000. Under this authority, the district has already issued $8,000,000 of 5 per cent. bonds, running from one year to twenty years; one-twentieth of the issue must be paid off and retired each year, and $200,000 have already been retired. These bonds have been sold at an average premium of about 1 1-5 per cent. The taxes afford a revenue sufficient to pay the interest on these bonds, to pay off and retire one-twentieth of the issue each year, and leave a surplus to apply upon the current obligations of the district incurred for construction.

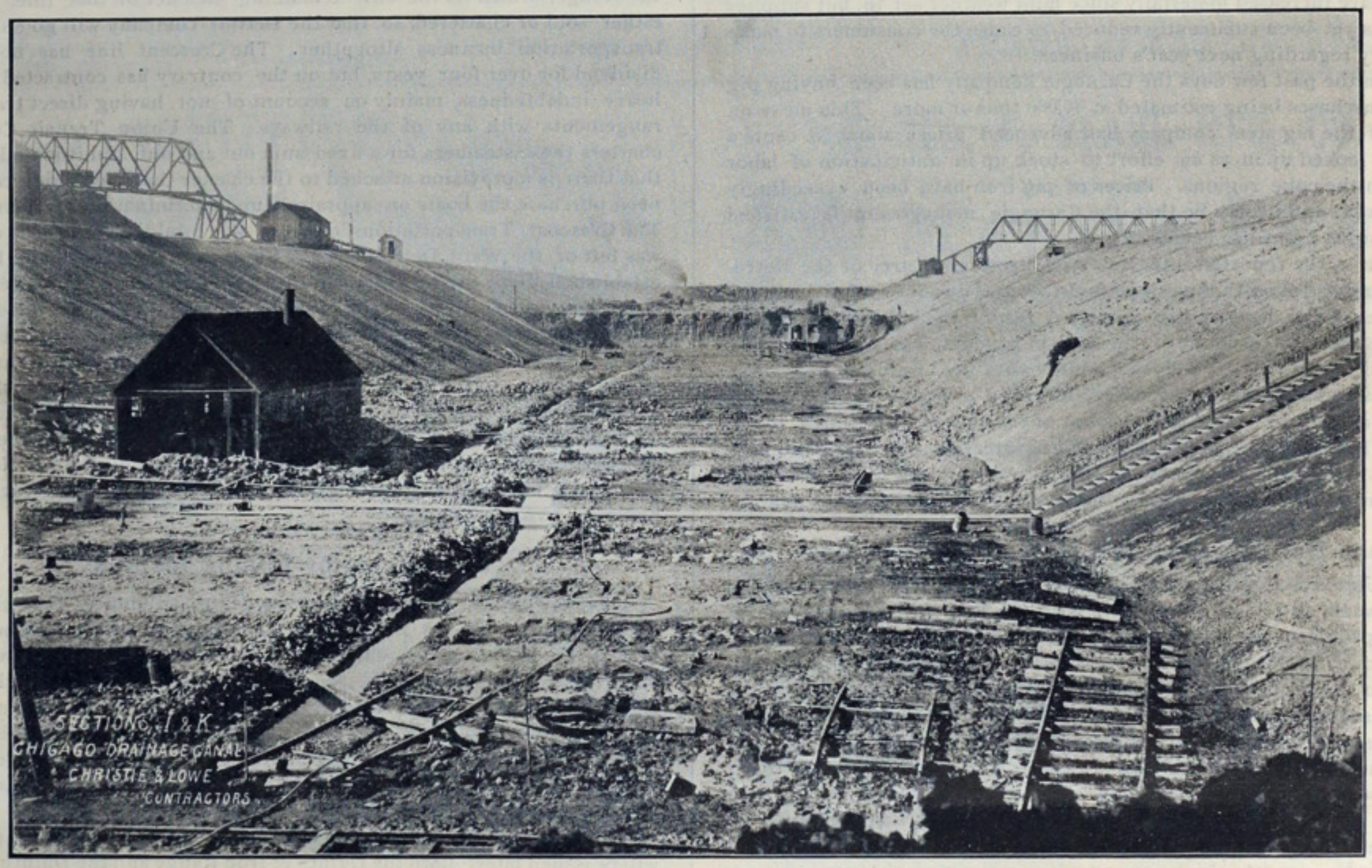
DESCRIPTION OF DISTRICT AND WORK UNDER CONTRACT.

The main drainage channel is now under contract from its confluence with the south branch of the Chicago river, at Robey street in Chicago to Lockport, its southern terminus. At the southern end of the channel the controlling works will be located. Beyond these works, the construction contemplated by the district will be the work necessary for conducting the flow from the channel in conjunction with the waters of the Desplaines river down the declivity to and through the city of Joliet, and making such changes in the Illinois and Michigan canal as the new conditions developed will make necessary.

Fifteen of twenty-nine sections involved in the work now under contract are numbered consecutively 1 to 15, and these extend south-westerly from a place called Willow Springs road to Lockport The average length of sections is one mile. Easterly from Willow Springs road to Chicago the sections are lettered from A to O, omitting J. The lettered sections are all in earth. while sections 1 to 6 inclusive are earth and rock and sections 7 to 15 inclusive are rock. Earth was first broken on Sept. 3, 1892, in a rock cut at a place called Lamont.

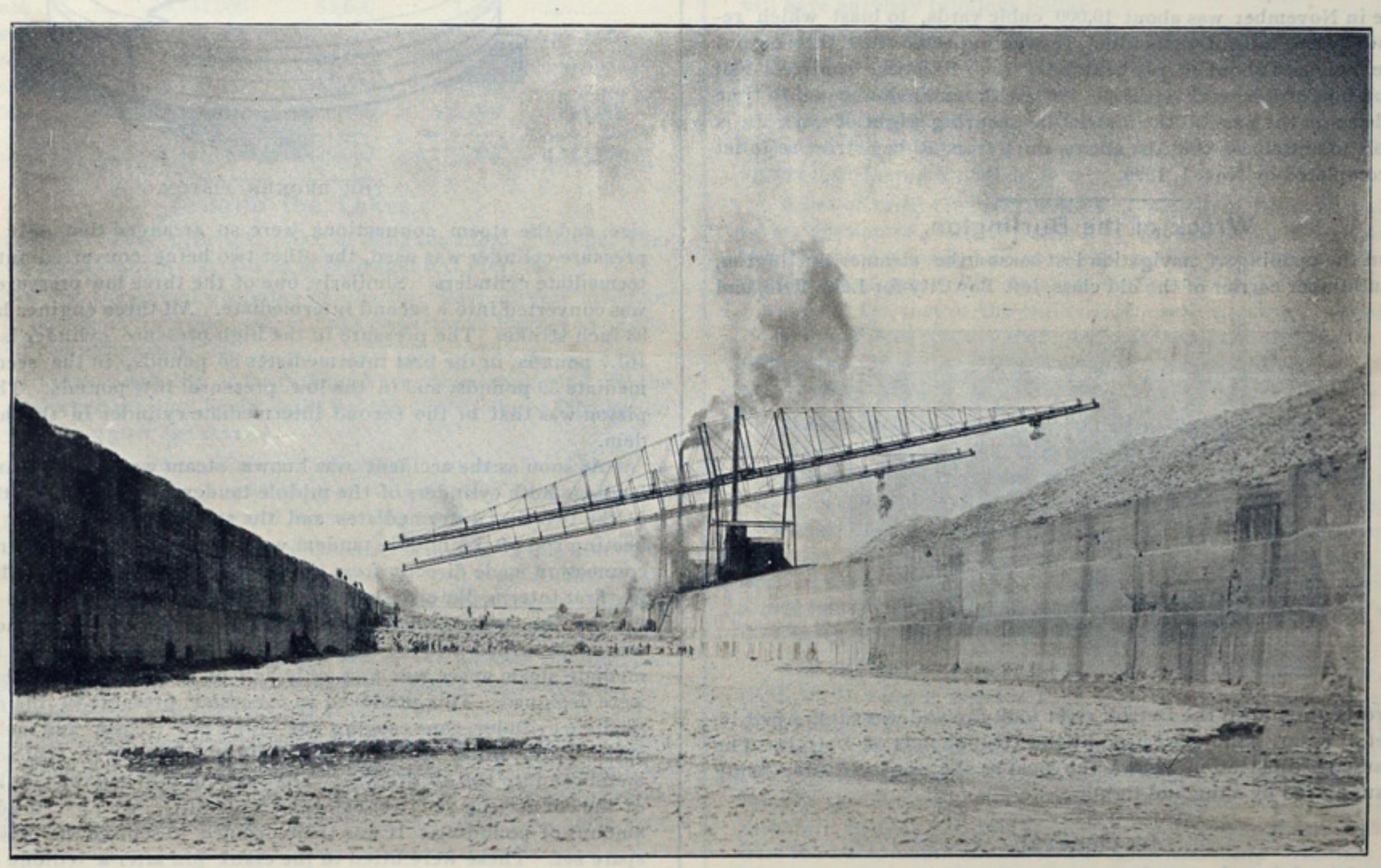
The Desplaines valley is traversed by the river from which it takes its name—a stream of wide fluctuations with no constant and reliable fountain supply. During some seasons its whole discharge would pass through a 6 inch pipe, and at others its volume reaches 800,000 cubic feet per minute. Then it rolls majestically along, flooding the whole valley. Such being the situation, control of this stream was a condition precedent to the successful prosecution of the work upon the main channel. This control has been secured by the outlay of nearly $1,000,000 in constructing what is known as the "river diversion channel." About 13 miles of new river channel had to be excavated, parallel with the location of the main drainage channel, and about 19 miles of levee built to divorce the waters of the Desplaines watershed from the channel which is to receive the waters of Lake Michigan and pass then on to the Missippi river, via the lower Desplaines and the Illinois rivers. The width of the river diversion channel on the bottom is 200 feet, side slopes one and one-half to one, grade generally 12-100 per 1,000 feet. At the head of this river diversion it was necessary to provide a safety valve in the form of a spillway, to allow surplus water to flow toward Chicago, because arrangements have not as yet been perfected for carrying the entire flood waters of the Desplaines through Joliet. This spillway is a concrete dam capped with cut stone, and its wings faced with stone masonry. It is 397 feet long and its crest is 16.25 feet above Chicago datum (this datum is referred to the low water of Lake Michigan of 1847, and is 579.61 above sea level at Sandy Hook). No water flows over the spillway until the volume passing the water guage above it reaches 300,000 cubic feet per minute.

The cross-section of the earth sections of the main channel from A to E inclusive is 202 feet on the bottom, side slopes two to one. This section extends for about 500 feet into the west end of F and then reduces to 110 feet on the bottom, preserving the same side slopes. The explanation for this change of cross section is as follows: Throughout the rock sections, and those sections in which there is a preponderance of hard material, or where rock may appear, the section adopted is designed according to law for a flow of 600,000 cubic feet of water per minute, which means provision for a population of 3,000,000 people. The narrower



CHARACTERISTIC EARTH CUT,—MAIN CHANNEL, SANITARY DISTRICT OF CHICAGO.—SECTIONS I AND K.

channel provides for the flow of 300,000 cubic feet per minute, or for about the present population of Chicago. The enlargement of the narrow channel can be made by the easier methods of excavation, such as dredging, whenever the needs of the city require it. The grade throughout the lettered sections is one foot in 40,000 (.025 per 1,000 feet) and the bottom of the channel at Robey street is 24.448 feet below datum. The numbered sections from No. 1 to No. 6 inclusive are underlaid with solid rock. The width of the bottom, in rock, is 160 feet, and walls of masonry laid in cement will be built upon the rock surface to a height of 5 feet above datum. Sections 7 to 14 inclusive, are in solid rock; width at bottom 160 feet, sides vertical, prism taken out in three stopes with offsets of 6 inches on each side for each cut, making top width 162 feet; grade in rock one foot in 20,000 (.05 per 1,000). Section No. 15 is also in rock and its cross-section is enlarged at its south end so as to form a "windage basin" in which large vessels may be turned around. The controlling works are located on this section. These works will consist of gates or movable dams by which the flow of water from the main channel into the tail race, which is to deliver the outflow into the Desplaines river, can be controlled. This river below Lockport follows the trough of the valley down a steep declivity to the canal basin in Joliet. The fluctuations in Lake Michigan, by varying slopes of water surface, will be felt at the controlling works, and provisions must be made to meet these fluctuations within a range of 5 feet above datum and 8 feet below, or an extreme oscillation of 13 feet. The fall from datum at the controlling works to the level of the upper basin will be about 42 feet, in a distance of about four and one-third miles. As the plans for controlling works have not been finally adopted by the board of trustees they cannot now be discussed.



CHARACTERISTIC ROCK CUT.—MAIN CHANNEL, SANITARY DISTRICT OF CHICAGO.—SECTION 10.

WORK ACCOMPLISHED—TEN MILLIONS EXPENDED.

The total amount of excavation involved in the construction of the main channel is 26,437,267 cubic yards of earth or glacial drift and 11,718,-101 cubic yards of solid rock, or an aggregate of 38,155,368 cubic yards, to which must be added the material excavated from the river diversion; glacial drift, 1,654,510 cubic yards; solid rock, 260,561 cubic yards; total river diversion, 1,915,071; grand total main channel and river diversion, 40,070,439 cubic yards. All of this work is now under contract and in addition thereto 327,000 cubic yards of retaining wall. The retaining wall is all to be laid in cement mortar. The rock when broken up expands about 80 per cent., and therefore the volume of the rock spoil banks will be nearly 21,300,000 cubic yards. The whole volume of spoil (earth and rock), if deposited in Lake Michigan in 40 feet of water, would make an island one mile square, with its surface 8 feet above water line.

The largest output of material made in any one month since this work was inaugurated was in August last, when the estimates for payment reached 1,160,613 cubic yards of glacial drift and 415,900 cubic yards of solid rock, calling for the payment of $665,052.31. The record made by the contractors for section 8 during the month of July has probably never been equalled in all the ages since men began to quarry stone. The movement upon that section for that month was 74,800 cubic yards of solid rock.

There has been expended Nov. 1, 1894: For right of way, $2,370,-030.03; for construction, $6,079,259.94; total, $8,449,289.97. This amount, together with the cost of administration, payment of bonds, interest, etc., brings the total expenditures to Nov. 1, 1894, to over $10,000,000. The estimated cost of all the work under contract is as follows: Construction account, $18,747,846.12; right-of-way account, $2,606,227.92; total, 321,354,-074.04.

METHODS OF WORKING.

On the earth sections some novelties have been introduced. On sections L and M cars specially constructed are loaded by steam shovels and drawn by steam hoists up a steep incline to a proper height where they run on to a tipple and are automatically dumped. Each incline is equipped with two 4-yard cars, which load and dump alternately. On sections I and K the contractors have erected bridges spanning the spoil bank at proper height, their supporting piers being carried on trucks which travel on tracks parrallel with the channel. From the channel end of the bridge an inclined track runs down into the cut. In connection with this device two 8-yard cars are used, which are successively loaded by steam shovel, drawn up the incline on the bridge by steam hoist, and then automatically dumped and immediately returned to the pit. An output of 100 yards per hour can probably be sustained by this combination of devices. On section H a conveying machine designed by Messrs. Hoover & Mason has been constructed on a mammoth scale. It is essentially a bridge spanning the channel with cantilever arms projecting far enough beyond on each side to overhang the spoil area. On this structure are mounted the necessary sprocket wheels and other machinery for carrying a series of steel pans which form the conveyer belt. The structure is 640 feet from end to end, it is mounted on trucks traveling upon tracks parallel with the channel, and its estimated capacity is 500 cubic yards per hour. On section F the material is taken from the steam shovel by cars fitted with pneumatic dumping apparatus, the power for which is supplied from the locomotive. The engineer operates these dumps just as he would apply the air brakes. Sections A, B and a portion of C are located in the old channel of the Desplaines, and are overlaid with muck to a considerable depth. This muck is being removed by hydraulic dredges. Each of these dredges now in use has a capacity of about 2,500 cubic yards in ten hours, and this output in solid matter represents about 8 per cent. of the capacity of the pumps. One great advantage of the hydraulic method of removal is that the material can be removed to any desired dumping ground within a distance of 3,000 feet without adding anything to the contract price of the excavation.

On those sections which are partly in earth and partly in rock, all of the usual methods of removing earth are in vogue, varied to suit peculiar

conditions or to meet the ideas of the contractors doing the work. On section No. 6 a large amount of muck has to be removed, and a very ingenious contractor has improvised a hydraulic dredge at a very small cost and is doing excellent work at a very moderate expense. On the rock sections, the sides are cut down vertically by channelling machines, and the merits of the several makes can be well demonstrated on this work. Of course steam drills are used, and on the sections which are best planted these are worked from a central power station by compressed air. The top lifts have been removed by the use of carts and tram cars, the traction for which latter is usually supplied by steam hoisting engines. The lower lifts are taken out by the use of the cable-ways, high power derricks and cantilever conveyers. The cable-ways as first constructed were not very successful, but experience gained upon this work resulted in improvements from time to time, and now, by the adoption of a simple improvement devised by Mr. H. C. Locher, one of the contractors, they have been brought to a stage of efficiency which makes them worthy competitors of the cantilever conveyers. The high power derricks used upon two of the sections have not come up to the expectations of the builders, and their use will probably be confined to the machines already in place. The cantilevers are probably the most perfect devices now known for hoisting and disposing of material from rock cuttings such as these. There are now eleven of these cantilevers working upon four sections. The daily movement of solid rock upon sections Nos. 7 to 14 inclusive in November was about 10,000 cubic yards, to blast which required nearly five tons of dynamite. It was expected that this output would be increased about 50 per cent. later on. Existing contracts call for completion of this work April 30, 1896, with extension equal to time lost by delay on the part of the district in securing right of way. It is reasonable to anticipate that the entire work from Robey street to Joliet will be completed by Nov. 1, 1896.

Wreck of the Burlington.

Upon the opening of navigation last season the steamer Burlington, a wooden lumber carrier of the old class, left Bay City for Lake Erie, and

while proceeding down the Detroit river took fire and was sunk, April 16, in 42 feet of water. She was raised by the Grummonds of Detroit. The accompanying illustration shows the boat as she appeared after being raised, supported by a tug and lighter.

In General.

Long Island Sound steamboats are profusely illustrated in the Engineering Magazine for April.

Mark W. Marsden of Philadelphia has secured letters patent on a filler composed essentially of compressed comminuted corn-stalk pith, the same to be used as a leak protector for vessels.

It is expected that the contract for the Holland submarine torpedo boat will be signed by the navy department and Mr. Holland within a few days. Mr. Holland will sublet the building of the vessel.

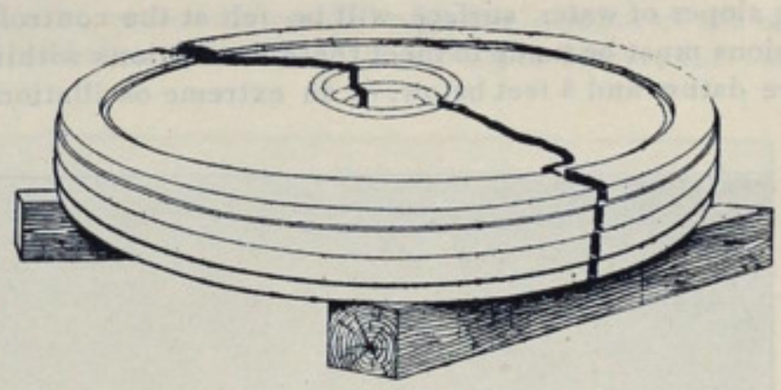
Plate of nickel steel, said to be lighter and smoother than Tobin bronze and containing qualities that will admit of burnishing to a piano finish, is to be used in the construction of the new Valkyrie, being built in Glasgow.

An amendment to the naval appropriation bill authorizes the secretary of the navy to use other metal than steel or an alloy in the construction of the proposed new torpedo boats. The amendment is made at the suggestion of the secretary, who desires that the department may be left free to avail itself of any improvements in naval construction so far as relates to the material best adapted for use in the building of torpedo boats. He thinks an alloy lighter than steel may be used.

A COPY OF THE PHOTO-GRAVURE SUPPLEMENT OF DIRECTORS OF THE LAKE CARRIERS' ASSOCIATION, TOGETHER WITH THE LARGE ENGRAVING OF THE STEAMER NORTH WEST, BOTH OF WHICH WERE CONTAINED IN RECENT BIG ISSUES OF THE REVIEW, WILL BE MAILED IN A PASTEBOARD TUBE TO ANY ADDRESS UPON RECEIPT OF 50 CENTS IN STAMPS.

LaGascogne's Peculiar Engines.

The breaking of a piston on the French transatlantic liner La Gascogne, which was the cause of great delay in the vessel reaching New York, was not an uncommon accident; neither was there anything new about the methods pursued by the engineers in getting their ship under way after the accident. It is probable, however, that the engines of La Gascogne are the only ones of their kind in use, and on this account interest attaches to the temporary alterations and repairs that resulted in the vessel reaching port in safety. There is little known regarding the cause of the break in the piston. The metal in the fracture shows no flaws, and no hammering was heard at the time of the accident to indicate that water was present in the cylinder. The piston rod was not bent, and was found to be in good condition for use. The engines of La Gascogne were originally three independent, compound tandem engines, each with a high and low pressure cylinder of 42⅛ inches and 79.92 inches in diameter, respectively. On converting these into a single quadruple expansion engine all the cylinders were retained except the single high pressure, which was replaced by a new and stronger one of the same



THE BROKEN PISTON.

size, and the steam connections were so arranged that only one high pressure cylinder was used, the other two being converted into first intermediate cylinders. Similarly, one of the three low pressure cylinders was converted into a second intermediate. All three engines have a 66.-93 inch stroke. The pressure in the high pressure cylinder is normally 161.7 pounds, in the first intermediates 85 pounds, in the second intermediate 39 pounds, and in the low pressure 10½ pounds. The broken piston was that of the second intermediate cylinder in the middle tandem.

As soon as the accident was known steam was shut off and repairs begun. Both cylinders of the midole tandem were cut out—that is, one of the two first intermediates and the second intermediate. The connecting rod of the middle tandem was taken off, and a temporary steam connection made directly from the high pressure cylinder to the remaining first intermediate, and from here to the two low pressure cylinders. Four of the twelve boilers were disconnected, and in sixteen hours steam was again turned into the engines. It is readily seen that the first intermediate steam space was now only half of that for which the engines were designed. This produced an excessive pressure in the first intermediate cylinder, thus causing the crank pin to heat and melt out the anti-friction white metal in the crank pin brasses, so that some of the metal ran into the oil grooves. This was cut out, and the crank pin bolts of the connecting rod were slacked up a little, which caused a certain amount of pounding. It was then decided to replace the brasses with a spare set. These were fitted to the crank pin after a tedious operation, which took a great deal of time because of the rolling of the ship in the heavy seaway. The crank pins are 25⅝ inches in diameter by 23½ inches long, and the brasses are not easy to handle under such conditions. The trip was La Gascogne's third one with her engines in this form.

L. R. Alberger, who is well known in connection with the independent condenser for marine engines manufactured by Henry R. Worthington of New York, was in Cleveland during the week in attendance at the convention of the National Electric Light Association. Mr. Fisher of Fisher & Porter, Chicago, who are the western agents of the Bethlehem Iron Company, also spent some time with the electric light men, and will spend several days in meeting vessel owners and builders of Cleveland and vicinity with whom he is discussing the merits of steel as against iron forgings. Mr. Alberger is introducing the Worthington self-cooling condenser, a patent apparatus that has been taken up by the big New York concern, and which is specially adapted to electric power plants that are not in close proximity to an abundant natural water supply. The claim for the machine is that it produces vacuum without natural water supply, requiring no more water than that used to feed the boilers. With its application non-condensing engines in any locality can, it is claimed, be run condensing with all the benefits that accrue by the use of a vacuum, and in the installation of new plants, compound condensing engines can be used with a resulting steam economy of 30 to 40 per cent. greater than was ever possible with single cylinder non-condensing engines.

Opening and Closing of Navigation.

The weather bureau has just issued a neat table showing dates of opening and closing and duration of navigation on Lake Superior, the list of ports including Sault Ste. Marie, Marquette, Duluth and Superior. The table covers all years from 1855 to 1894, inclusive. Averages for this period of forty years are as follows:

Average date of opening—Sault Ste. Marie, May 1; Marquette, May 4; Duluth, April 24; Port Arthur, April 26.

Average date of closing—Sault Ste. Marie, Dec. 1; Marquette, Nov. 28; Duluth, Dec. 8; Port Arthur, Dec. 12.

Average number of days of open navigation—Sault Ste. Marie, 214; Marquette, 208; Duluth, 228; Port Arthur, 236.

Average number of days closed—Sault Ste. Marie, 151; Marquette, 157; Duluth, 137; Port Arthur, 129.

Stocks of Grain at Lake Ports.

The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store and afloat at the principal points of accumulation on the lakes on Feb. 23, 1895:

	Wheat, bushels.		Corn, bushels.	
	In store.	Afloat.	In store.	Afloat.
Chicago	25,375,000	1,437,000	4,689,000	1,500,000
Duluth	10,144,000	85,000	1,000	.....
Milwaukee	667,000	.....	.....	.....
Detroit	1,315,000	257,000	104,000	.....
Toledo	2,736,000	337,000	844,000	.....
Buffalo	3,218,000	314,000	135,000	684,000
Total	43,455,000	2,430,000	5,773,000	2,184,000

Around the Lakes.

After March 1, the principal office of Hughes Bros. & Bangs, contractors on Sault canal work, will be at Narragansett Pier, R. I.

Reports are current of a number of charters having been made for lumber to be moved from the head of Lake Superior to Buffalo upon the opening of navigation at $1.75.

City of Toronto and City of Parry Sound are names suggested for the wooden passenger steamer being built by the North Shore Navigation Company for Georgian bay service.

Major W. B. Stockman, forecast official of the weather bureau at Cleveland, addressed a large gathering of ship masters Wednesday, on matters pertaining to the service of the weather bureau.

Capt. J. B. Hall, who represented the American Steel Barge Company at Lake Erie ports up to last fall, has decided to open a vessel and insurance agency in Cleveland and will be located at 411 Perry-Payne building.

The failure is reported from Duluth of William McKinley, the well-known iron mine and lumber capitalist, one of the pioneer operators on the Mesabi range. The assignment was precipated by judgments for large amounts. The liabilities are put at $500,000.

Lake underwriters seem to be taking matters easy this winter. There is not the usual anxiety and figuring for business. C. A. Macdonald of Chicago was in Cleveland during the week, but he is the first general agent that has been heard of away from Chicago or Buffalo for some time past.

George Lockerbie, Detroit dredging contractor, who two weeks ago submitted a bid of 10 cents per cubic yard on a contract for harbor dredging in Cleveland, which extended over a period of five years, has informed the city authorities of unwillingness to carry out the contract, and it is very probable that another call will be made for proposals on the work.

On the opening of navigation a fixed red light of the sixth order will be established in each of the structures recently erected on the northerly side of the mouth of the Maumee river, below the city of Toledo, and on the south-westerly prolongation of the axis of the new straight channel in Maumee bay, leading S. W. by W. ⅛ W. from the main crib of the Maumee bay ranges light station to the natural channel entrance to the river.

Lieut. S. M. Landrey of the revenue cutter service has been detailed as assistant inspector of the ninth and tenth life-saving districts, with headquarters at Detroit, to succeed Lieut. J. C. Moore, who has filled that position three years. Lieut. Landrey is about 30 years old, and a graduate of the training ship Salmon P. Chase, which makes its headquarters at New Bedford, Mass. His field of operations will comprise Lakes Superior, Huron, Erie and possibly Ontario.

At the last annual meeting of the Lake Carriers' Association a committee, of which J. C. Gilchrist of Cleveland is chairman, was appointed to take steps towards reducing charges for loading lumber at Lake Superior ports, and to correct abuses that are connected with the work, and which result to the disadvantage of vessels engaged in the trade. The committee is collecting information and otherwise preparing to move in this matter before the opening of navigation.

Capt. John Nagle of Saginaw will next week open a vessel brokerage and tug office in the marine building, Toledo. The Gard Island Ice Company of the same place has purchased the tug J. P. Logie of Saginaw, and the tug Excelsior, which was last year operated in opposition to the tug pool, will be continued as an "independent" tug again next season. Extensive repairs are being made to the Ohio Central docks, and the Craig Ship Building Company is pushing operations on the Conneaut car ferries, the boats being well in frame.

In the Detroit News, of Feb. 19, J. M. McGregor submits a communication criticising at great length the Ann Arbor car ferries, which have been in the service for some time past on Lake Michigan. He submits that in these boats what is gained in carrying capacity and draft of water must be lost in speed, seagoing and ice-crushing qualities. Every part of the water line of a successful ice-breaker, he says, must meet the ice obliquely. The curved sides and ends of a boat will easily force the ice underneath her, but the straight wall sides of a boat will not easily force miles of an ice field asunder.

Trade Notes.

A steam yacht being built by Lewis Nixon at Elizabethport, N. J., will have an Almy tubulous boiler.

Charles L. Seabury & Co. of Nyack, N. Y., have booked an order for a wooden steam yacht of 100 feet length.

Through its Cleveland agent, E. S. Ludlow, the Buffalo Forge Company has arranged with James Corrigan of Cleveland to equip his four steamers, Australasia, Bulgaria, Italia and Caledonia, with their system of blowers producing forced draft.

A list of orders for patent metallic life boats, life rafts and other life saving appliances recently received by Thomas Drien & Sons of Wilmington, Del., and printed in New York marine publications, includes the equipment of practically all large vessels building on the Atlantic coast. A single order, that of the builders of a new passenger steamer for the Norfolk and Washington route, calls for six 22-foot metallic life boats, with patent beaded galvanized steel bottoms, two large-sized sea rafts and a full complement of life preservers.

"Safety in Travel" is a pretty little book published by the Chesapeake & Ohio Railway Company, famous for its F. F. V. limited. The book is full of beautiful illustrations, and the reading matter gives as the reason why it is safe and agreeable to travel over the line, that its employes come from their homes or from some of the half dozen railroad Young Men's Christian Association buildings, which the company has built and maintains at division points. It is a rare compliment to the association and a neat advertisement forthe railroad. A copy may be had by addressing C. B. Ryan, Cincineati, O.

The tug Zenith, built by Edward Heath of Benton Harbor, Mich., for Capt. W. H. Singer, is not a large boat, but she will rank among the best craft of her kind on the lakes. She was launched at Benton Harbor a few days ago. Her length over all is 95 feet, beam 25 feet and hold 12 feet. She will have fore-and-aft compound engines, 18 and 36 by 30 inches, built by the Montague Iron Works of Montague, Mich., and her equipment will include a hydraulic steerer, steam gypsy and Providence windlass, the latter manufactured by the American Ship Windlass Company. She has a 9-foot wheel, and the boiler is 9 by 14 feet, allowed 145 pounds of steam.

William Bishop's Sons is now the name of the firm that has carried on a business for thirty-five years in New York and has done considerable on the lakes through furnishing ship closets. The sanitary part of every vessel should be well cared for, especially on passenger steamers. Their latest improvement, with self-closing water and air valve, allows the closet to be set below water line without having to run either supply or discharge pipes up above the water line to prevent the sea water syphoning in. The U. S. S. Columbia and Minneapolis and many other naval vessels are fitted with this company's No. 1 naval closets. The office is located at 205 South street.

The Frontier Iron Works of Detroit inserts in all mail matter going out from its office the following extract from a letter, date of January 24, 1895, written by A. B. Lafranier, chief engineer of the steamer Shenandoah, which was built by Capt. James Davidson of West Bay City and engined by the Detroit firm: "I will acknowledge that the Shenandoah's engines are the finest working engines that I have ever handled, When I layed her up in the fall, I did not find one mark or scratch on her slides, cylinders, valve faces, or any of the bearings. I did not lay out one cent for repairs; did not find a leak in any of the steam fittings. I had no trouble getting steam when working engine at full gear." The Shenandoah went into commission in August last. She is 330 feet over all, and her engines are triple expansion of 1,560 I. H. P., the cylinders being 20, 32 and 54 inches diameter by 42 inches stroke.

MARINE REVIEW

DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

Published every Thursday at No. 516 Perry-Payne building, Cleveland, O.

SUBSCRIPTION—$2.00 per year in advance. Single copies 10 cents each. Convenient binders sent, post paid, 75 cents. Advertising rates on application.

The books of the United States treasury department contain the names of 3,341 vessels, of 1,227,400.72 gross tons register in the lake trade. The number of steam vessels of 1,000 gross tons and over that amount on the lakes on June 30, 1894, was 359 and their aggregate gross tonnage 634,467.84; the number of vessels of this class owned in all other parts of the country on the same date was 316 and their tonnage 642,642.50, so that half of the best steamships in all the United States are owned on the lakes. The classification of the entire lake fleet on June 30, 1894, was as follows:

Class.	Number.	Gross Tonnage.
Steam vessels	1,731	843,239.65
Sailing vessels	1,139	302,985.31
Canal boats	386	41,961.25
Barges	85	39,214.51
Total	3,341	1,227,400.72

The gross registered tonnage of vessels built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

	Number.	Net Tonnage.
Year ending June 30, 1890	218	108,515.00
" " " 1891	204	111,856.45
" " " 1892	169	45,168.98
" " " 1893	175	99,271.24
" " " 1894	106	41,984.61
Total	872	406,976.28

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC.

	St. Mary's Falls Canal.			Suez Canal.		
	1893.	1892.	1891.	1893.	1892.	1891.
No. vessel passages	12,008	12,580	10,191	3,341	3,559	4,207
Ton'ge, net regist'd	9,849,754	10,647,203	8,400,685	7,659,068	7,712,028	8,698,777
Days of Navigation	219	223	225	365	365	365

Entered at Cleveland Post Office as Second-class Mail Matter.

NOT LONG ago the steamer Norman, one of the large iron ore carriers of Cleveland, was fined for not having her life boats hung on davits, a requirement incumbent upon passenger boats. The Norman has a spare room or two for the accomodation of her owners, but alike to other freight vessels carried her small boats on deck. It has been proven, in connection with the awful disaster attending the loss of the steamer Elbe, that the ingenious devices on that big passenger steamer for lowering life boats, were of no value whatever on one side of the ship, as she was listed by the collision, and the davits had not sufficient outreach to launch the boats. Why is it thought absolutely necessary to have passenger steamers carry their small boats on useless davits? Is there not some way in which a place could be provided for them in the center of the ship, so that there might be at least a possibility of launching all of them by the more reliable method of cranes?

THE NEW YORK legislature has again passed a bill for improvement of the Erie and other state canals on a plan of 9 feet draft, but the act is subject to the approval by the people at the November election of a clause bonding the state for $9,000,000 to procure funds for carrying out its provisions. The canal interests are jubilant over the passage of this act, but the money provisions of it will never be endorsed by a full expression from the electors of the state. The state of New York should not be compelled to incur millions of expense in improving its canal system for the benefit of the whole country, and any improvement that might be undertaken by the state would not meet the radical changes demanded for a new American waterway from the lakes to the Atlantic. The Erie canal question is now no nearer to a settlement than it has been in the past, and it will not be until the subject of a deep-water outlet from the lakes to the seaboard is taken up in a definite manner by the general government.

IN AN article treating of ships of the Cunard line built in the forties, the editor of Engineering, the great London technical publication, refers to a description of one of the boats previously printed in that journal, and says very calmly: "See Vol. II, page 421." The present volume of Engineering is numbered LIX. At first thought it would seem that this editor expected his patrons to provide a large-sized store house for newspaper files. To be serious, however, it is very probable that not a few of the older engineering establishments in England, if not in this country, have bound volumes of the journal referred to extending back many years, and this incident serves to show the great value of high class trade publications.

REPRESENTATIVES of Great Britain ruled the International Marine Conference held in this country for the purpose of formulating rules to prevent collissions at sea. The government of Great Britain accepted the rules adopted by the conference and a short time ago urged action on the part of the United States and other governments towards putting these rules into effect. The rules were accordingly promulgated by all of the principal maritime powers, and now at the last moment Great Britain has been the cause of overthrowing the entire work of the conference. British ship masters at the eleventh hour declared the rules impracticable and denounced the British board of trade for agreeing to their adoption. Whatever may be said of the merits or demerits of the rules, the action of the British government in the whole matter is a bungling disgrace to that country.

IN THE American Economist of New York, issue of Feb. 22, F. W. Hughes has an extensive article on the shipping question, which is accompanied by diagrams showing the tonnage of American ships employed in the coasting trade and in the foreign trade from 1789 to 1894, and also the total ocean commerce of the United States (imports and exports) from 1791 to 1894.

Steel for Boilers.

Within the past decade the use of open hearth steel has almost entirely superceded all other materials for boiler making purposes, owing to its extreme toughness and ductility, and the combination of maximum tensile strength with these qualities. When steel was first used for this purpose high tensile strength was considered to be of prime importance, but it was soon found that toughness and ductility were of more essential value. The first boiler steel specifications called for metal having a tensile strength of 60,000 pounds per square inch, without much being demanded in the way of percentage of elongation, although hot and cold bending tests were specified. It was found in practice that these sheels cracked easily, especially when subjected to the sudden coolings due to blowing off and washing out hot. For awhile, therefore, steel was generally discredited for boiler making. Later on it was found that a steel possessing from 50,000 to 55,000 pounds tensile strength and an elongation not below 25 per cent. in four inches, and sufficiently low in carbon and other hardening constituents to allow of being heated to a dull cherry-red and plunged into cold water (60 degrees F.) without hardening so far that a piece of half-inch metal would bend double without showing signs of cracking, was a much more desirable material in every way for fire-box and other stayed sheets, more especially those subjected to the direct action of the fire. A sheet as low as from 45,000 to 50,000 pounds' tensile strength and an elongation of from 25 to 30 per cent. in 8 inches gave the the best results.—William O. Webber on "Modern Boiler Making," in Cassier's Magazine for March.

Heavy Draft on Lake Ores.

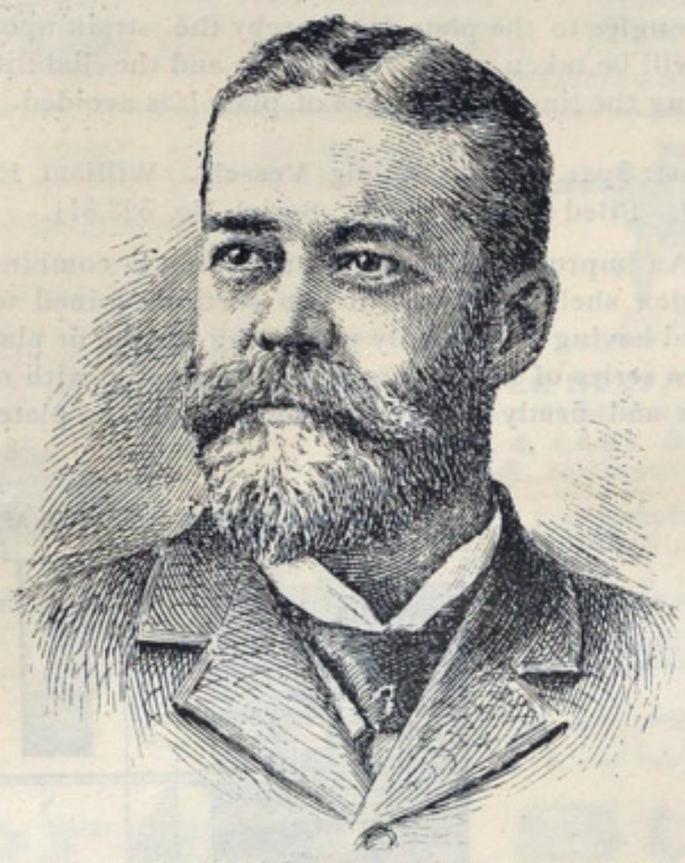
The statistics of Bessemer steel production in the United States in 1894, just published, will be read with special interest by producers of Lake Superior iron ores. The total of 3,579,101 gross tons of Bessemer ingots, while considerably short of the 4,168,435 tons of 1892, is an increase of 11 per cent. over the total for 1893. When it is considered, too, that the output of open hearth steel ingots, which reached 737,890 gross tons in 1893, and probably a greater amount last year, is largely from high-grade lake ores, most of them within or close to the Bessemer limit in phosphorus, it will be seen that the draft upon the best ores of the Lake Superior region is at a prodigious rate to-day. And a study of the blast furnace returns from month to month shows that while furnaces here and there drop out of the active list, there is no diminution of the output of those tributary to the lake region.—Iron Trade Review.

A wreck indicating buoy recently exhibited at the yachting exhibition in London is intended to accomplish double as much as is expected of similar devices patented in this country. It is carried on deck, and when the ship sinks it floats and records at once the hour and minute of the disaster. It then automatically fires rockets, burns blue lights, shows a lamp and rings a bell.

"SAILING DIRECTIONS FOR LAKE SUPERIOR, ST. MARY'S RIVER AND STRAITS OF MACKINAC" IS A PUBLICATION RECENTLY ISSUED BY THE UNITED STATES HYDROGRAPHIC OFFICE. IT IS FAR IN ADVANCE OF PUBLICATIONS OF THE COAST PILOT KIND. PRICE $1. ADDRESS MARINE REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND, O. WE HAVE NO HESITANCY IN RECOMMENDING THIS BOOK.

Eugene L. Maxwell.

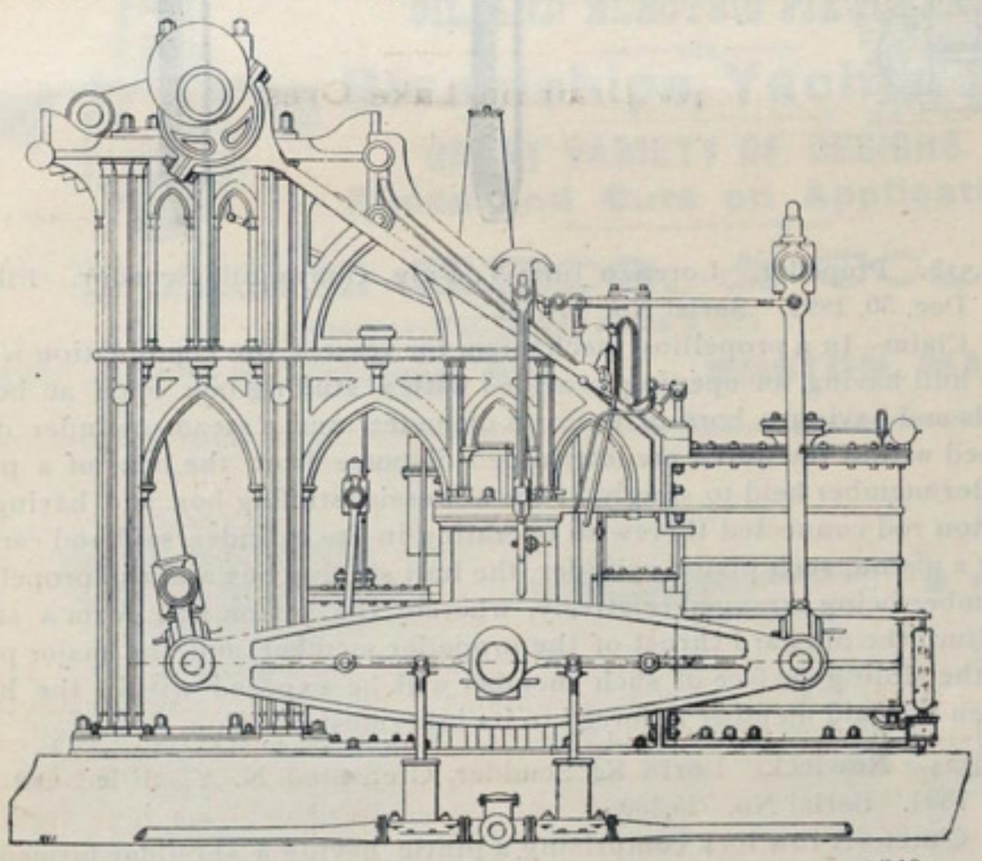
Eugene Lacelles Maxwell, whose death was announced from New York a few days ago, was a member of the firm of Manning, Maxwell & Moore, which is probably better known to users of railway and machinist tools and supplies than any other house in this country. Mr. Maxwell had been associated in business with Henry S. Manning for twenty years,



and fourteen years ago next May C A. Moore became a member of the firm. Mr. Maxwell was born in Brooklyn and educated at the Polytechnic Institute in that city. He was president of the Ashcroft Manufacturing Company and of the Pond Machine Tool Company, and vice-president of the Shaw Electric Crane Company of Muskegon, Mich., and of the Tabor Manufacturing Company and a director in the Hayden & Derby Manufacturing Company and the Consolidated Safety Valve Company, of Bridgeport, Conn., and was treasurer of Pedrick & Ayer Company of Philadelphia. None of these companies was founded or developed by him, but were companies in which his firm had purchased the controlling interest, and in which they became officers and directors to maintain and recognize their affairs. Mr. Maxwell was a member of the Montauk Club, of which his associate, Mr. Charles A. Moore, is president and he was also prominent in other leading social organizations Brooklyn's leading newspaper, the Eagle, says in a lengthy editorial that a better man than Eugene L. Maxwell did not live in Brooklyn.

Engines of Atlantic Side-wheel Steamers.

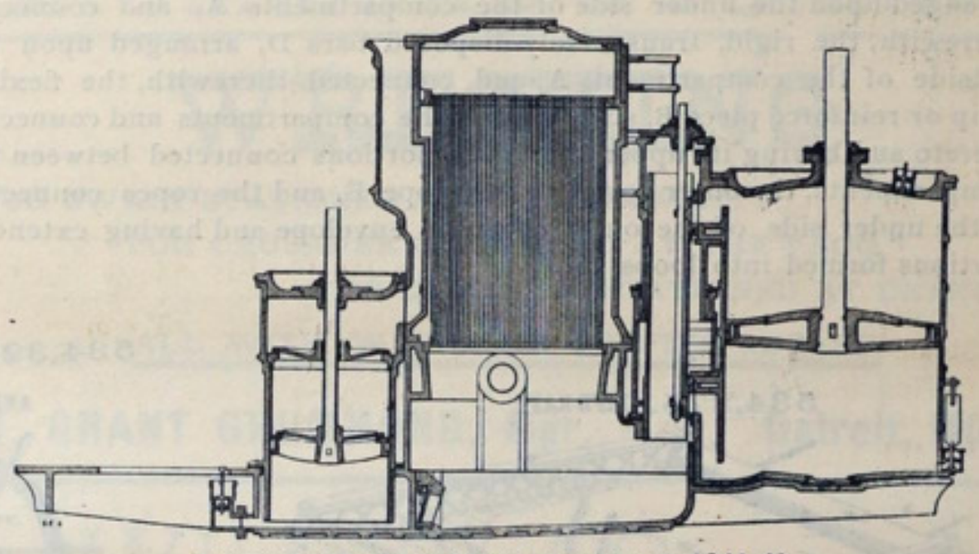
In an article dealing with the history of the Cunard company and the early Atlantic passenger steamers of that company, Engineering of London presents some engravings from rare prints of engines with which these ships were equipped. The first four steamers of the Cunard



ENGINES OF THE FIRST CUNARD STEAMER, BRITANNIA, 1840.

company were the Britania, Acadia, Caledonia and Columbia, which were each 207 feet long, 34 feet 4 inches beam and 22 feet 6 inches depth, while the tonnage was 1,154, cargo capacity 225 tons and passenger capacity 115. The engines of the Britannia, first of these boats, are illustrated herewith. They had cylinders 72 inches in diameter and a stroke of 6 feet 10 inches. The paddle-wheels were 28 feet in diameter. The first voyage was completed on July 4, 1840, the time from Liverpool to Boston being 14 days 8 hours, and the average speed 8½ knots, while the coal consumptian was thirty-eight tons per day.

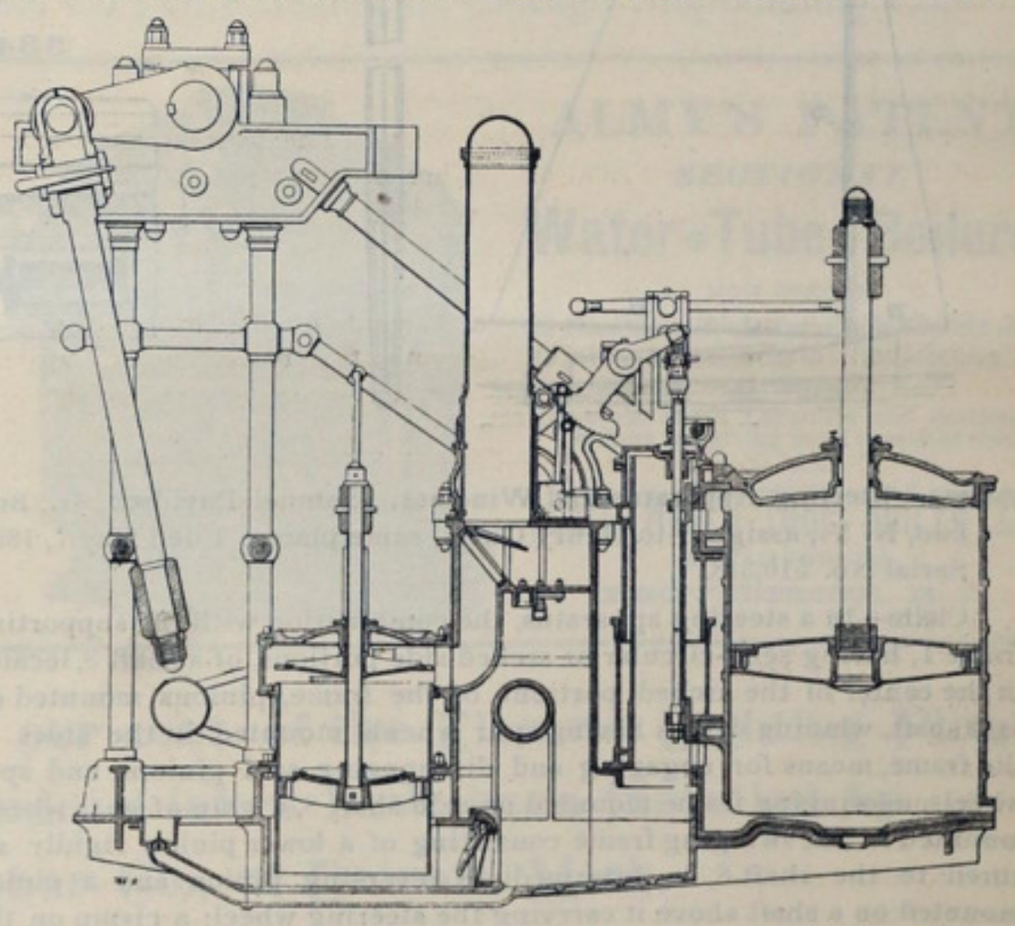
The second illustration represents the engines of the British Queen, built by Robert Napier, Glasgow, in 1842. The British Queen was not a Cunard vessel, but she is remarkable as being the pioneer vessel running from the Thames to New York. She was owned by the British and American Steam Navigation Company, which has at times been confounded with the original Cunard company, but between which there was no connection. This vessel was 275 feet over all, 40½ feet breadth inside of paddle boxes, 27 feet depth and of 1,862 tons register. These en-



ENGINES OF THE BRITISH QUEEN, 1841-42.

gines, which were of 500 nominal horse power, were beam engines with two cylinders, 77½ inches in diameter, and 7 feet stroke, weighing twelve tons each, and driving paddle wheels about 31 feet 6 inches in diameter. The remarkable thing about them was the fact that they were, as appears from the illustration, surface-condensing engines. Owing to galvanic action, the condensers were not altogether a success in these earlier vessels, and the jet condenser was adopted in British mail steamers for many years subsequent to 1842. In America, however, surface condensers were used in the interval. The maiden voyage of the British Queen took over sixteen days, and she never distinguished herself by much better speed. The company owning her came to a disastrous end.

In 1847, the mail service between England and America became weekly, instead of fortnightly as before, and to meet its requirements there were built for the Cunard company four new vessels, named the America, Niagara, Europe, and Canada, each of 1820 tons, with side lever engines of 680 nominal horse power. The America was the swiftest vessel on the Atlantic in her time, her fastest voyage from Liverpool to Halifax being done in 8 days 27 hours out, and 8 days 10 hours home. Her



ENGINES OF THE CUNARD STEAMER AMERICA, 1847.

engines also were built by Mr. Robert Napier. It will be seen they were of the side lever type. The cylinders were 88¾ inches and 90 inches in diameter, and were fitted with long D valves which could be worked by hand for stopping and starting. The pistons were of brass; the side levers were of cast iron, and weighed nine tons each. The entablatures were connected to the cylinders by wrought-iron columns, which had their ends fitted into taper sockets. The sockets were bored, and columns turned nearly to fit, and then the ends of the columns were carefully draw-filed until they bedded into their places. These columns were 9 inches in diameter. The bedplate weighed thirty-six tons.

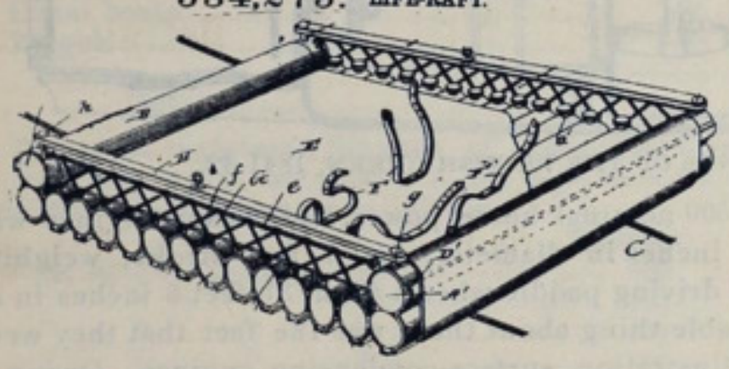
Illustrated Patent Record.

SELECTED ABSTRACTS OF SPECIFICATIONS OF A MARINE NATURE—FROM LATEST PATENT OFFICE REPORTS.

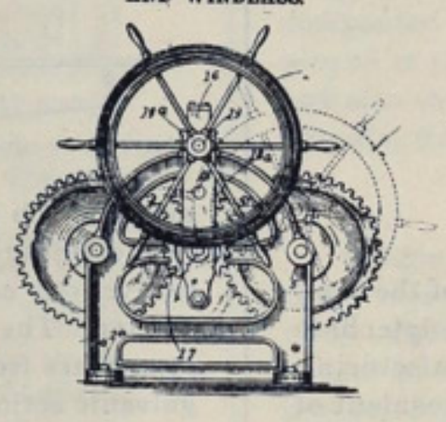
534,275. **Life Raft.** Bernard H. Meyers, New York, N. Y. Filed May 16, 1894. Serial No. 511,443.

Claim—A life raft comprising a series of transversely disposed, inflated compartments A, the inflated compartments a′, arranged upon the end compartments A, a flexible connection between the compartments whereby the raft may be compactly folded without exhausting the air from said compartments, the rigid, transversely disposed bars D, arranged upon the under side of the compartments A, and connected therewith, the rigid, transversely-disposed bars D, arranged upon the outside of the compartments A, and connected therewith, the flexible strip or reinforce piece B, surrounding the compartments and connected thereto and having its upper and lower portions connected between the compartments, the outer cover or envelope E, and the ropes connected to the under side of the outer cover or envelope and having extended portions formed into loops.

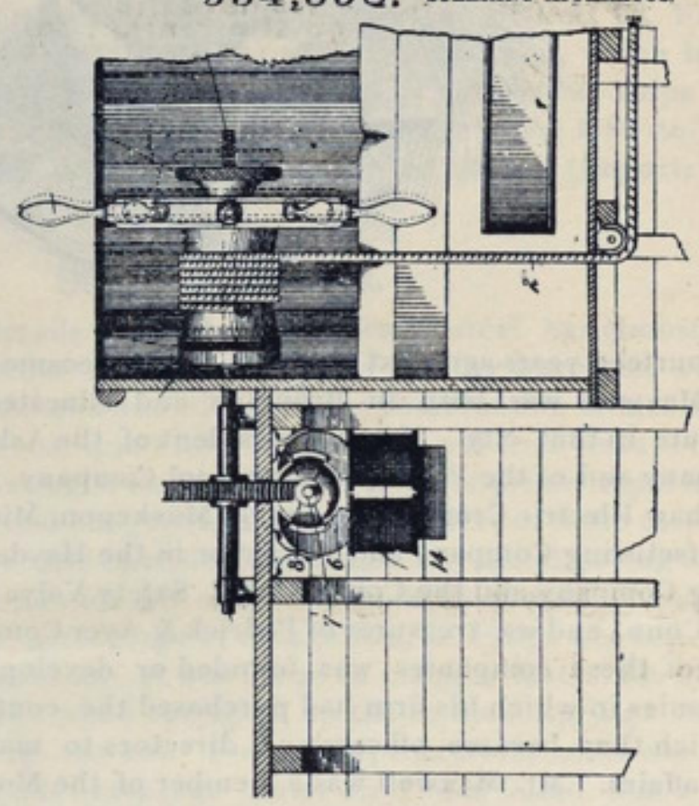
534,275. LIFE-RAFT.



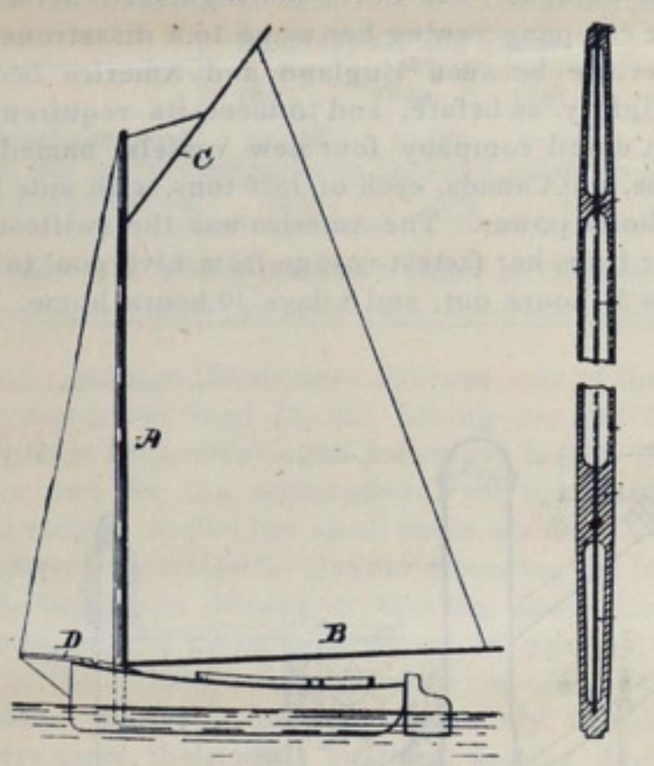
534,323. STEERING APPARATUS AND WINDLASS.



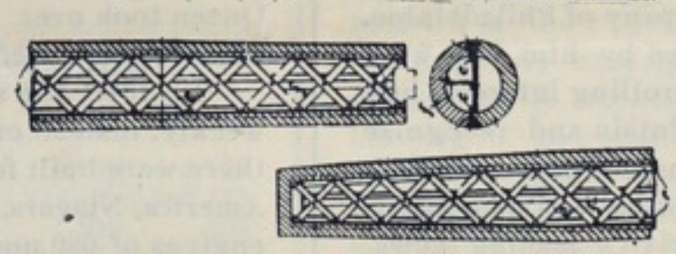
534,358. STEERING APPARATUS.



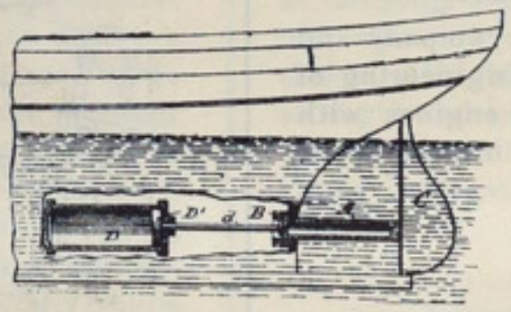
534,397. MAST OR SPAR.



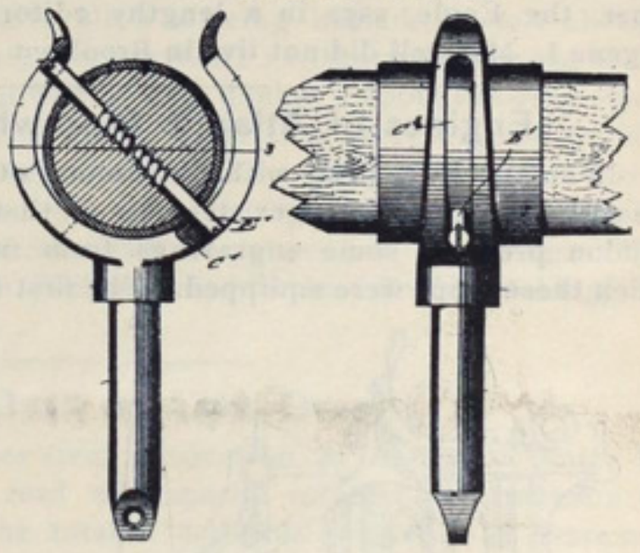
534,398. MAST, SPAR, &c., FOR SAILING-VESSELS.



534,518. PROPELLER



534,524. ROWLOCK.



534,323. **Steering Apparatus and Windlass.** Samuel Davidson, Jr., Buffalo, N. Y., assignor to Henry Guest, same place. Filed May 7, 1894. Serial No. 510,318.

Claim—In a steering apparatus, the combination with the supporting frame 1, having semi-circular or arched side portions, of a shaft 8, located in the center of the arched portions of the frame, pinions mounted on said shaft, winding drums having spur wheels mounted in the sides of the frame, means for engaging and disengaging said pinions and spur wheels, a swinging frame mounted on said shaft 8, a train of gear wheels mounted in the swinging frame consisting of a lower pinion rigidly secured to the shaft 8, an intermediate reversing pinion and a pinion mounted on a shaft above it carrying the steering wheel; a clamp on the swinging frame adapted to clamp over the edge of the semi-circular top of the frame portion 1, and means substantially as above set forth for securing the swinging frame at any point to which it may be adjusted.

534,358. **Steering Apparatus.** Rufus N. Chamberlain, New York, N. Y. Filed May 16, 1894. Serial No. 511,489.

Claim.—In a steering gear, the combination of a shaft 3 having a collar 10 and having electric driving mechanism therefor, a drum 1 free to revolve on said shaft and having rigid with it the hand wheel 5 and nut and screw 12, 13, adapted to bind the drum against said collar and rigidly connected to the electrically driven shaft.

534,397. **Mast or Spar.** William E. Lewis, Newark, N. J. Filed May 2, 1894. Serial No. 509,858.

Claim—The combination with a hollow wooden mast—the inner surface of which is grooved longitudinally upon its opposite sides—of a plate b extending across the hollow of the mast with its edges seated in the recesses, and a cross-plate c at the bottom of each recess and standing at right angles to the plate b, whereby the strain upon the edges of the plate b will be taken up by the plate c and the liability of splitting the mast along the line of the edges of plate b is avoided.

534,398. **Mast, Spar, etc., for Sailing Vessels.** William E. Lewis, Newark, N. J. Filed Sept. 22, 1894. Serial No. 523,811.

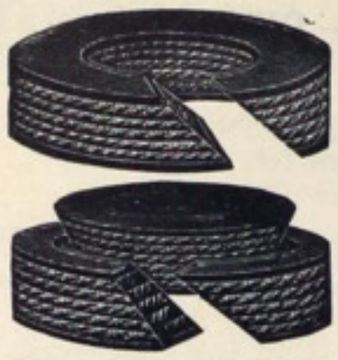
Claim—An improved mast or spar in which is combined a hollow or tubular wooden shell composed of two sections joined together longitudinally, and having an inwardly projecting tongue or plate at each side thereof, and a series of braces arranged diagonally with respect to the mast or spar and firmly secured to said tongues or plates and to one another.

534,518. **Propellor.** Lorenzo Julia Y. Puig, Guayaquil, Ecuador. Filed Dec. 30, 1892. Serial No. 456,782.

Claim—In a propelling mechanism for vessels, the combination with the hull having an opening provided with a stuffing box open at both ends and having a bore of uniform diameter, and a steam cylinder disposed within the hull a predetermined distance from the box, of a propeller member held to snugly fit the aforesaid stuffing box and having a piston rod connected therewith operating in the cylinder, said rod carrying a piston, such piston cylinder, the hull stuffing box and the propellor member being arranged relatively, whereby the piston will form a stop to limit the outward thrust of the propeller member, and the major part of the sliding surface of such member will be exposed within the hull when the said member is forced to its innermost position.

534,524. **Rowlock.** Lorin K. Scudder, Glenwood, N. Y. Filed Oct. 9, 1894. Serial No. 525,350.

Claim—A row lock comprising a pintle having a shoulder formed at the upper end thereof, curved horns integrally formed with said pintle and extending from opposite sides of said shoulder, said horns being each provided with an open slot extending through it, the slots having their ends opposite each other and screws secured in the stem of the oar with their ends projecting in opposite directions and adapted to engage and play along said slots, said screws being aligned diametrically of the oar.



GARLOCK PACKINGS.

Our Elastic Ring, Sectional, Spiral and Special Water Packings are the leaders in this line. For Steam, Water, Ammonia, High Speed Work and all places where packings are used they excel. Try our Special Water Packing, fully guaranteed for water end of pumps. See that our trade mark is on each package. Correspondence solicited.

NEW YORK, 136 Liberty St.
CHICAGO, 5& & 60 So. Canal St.
PHILADELPHIA, 28 N. 5th St.
PITTSBURGH, 99 First Ave.
OMAHA, NEB., 922 Farnam St.
ST. LOUIS, 415 Morgan St.

THE GARLOCK PACKING CO.

Factories and Main Offices: PALMYRA, N. Y. ROME, GA.

THURMAN FUEL OIL BURNER CO.,

Designers, Contractors & Engineers, for Complete Fuel Oil Equipment.

General Offices, 35 and 36 Cordova Building,
INDIANAPOLIS, IND.

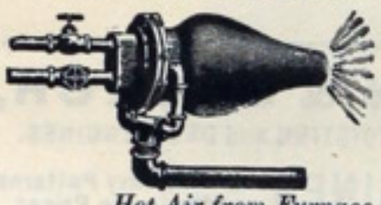
Hot Air from Furnace.
BURNER NO. 4.

Acknowledged the best for Boilers, Forges, Furnaces, Ovens, etc. Write for Catalogues.

E. A. BOLDT, Sole Agent, Eastern States, 320 and 322 Broadway, New York, N.Y.

J. POWER HELY, Chicago, Manager 1405 Monadnock Block, Chicago, Ill.

PARKE & LACY CO. 21-23 Fremont St., San Francisco, Cal.



Hot Air from Furnace.
BURNER NO. 6.

We have the only successful oil burner on the market for steam yachts with large or small boilers.

Burners for every branch of indusiry where heat for any purpose is used.

WRITE US FOR PRICES.

GRUMMOND TUG LINE

WRECKING

TUG SWAIN STATIONED AT MACKINAW CITY.
TUG CRUSADER STATIONED AT THE "SOO."
TUG CHAMPION STATIONED AT DETROIT.
ALL WITH WRECKING OUTFITS ABOARD.

U. GRANT GRUMMOND, Mgr., - Detroit, Mich.

THE BABCOCK & WILCOX CO.

Forged Steel Water-Tube MARINE BOILER,

29 CORTLANDT ST., NEW YORK.

Boilers sold to steamers:

Nero,
Algerie,
Eleanor,
Reverie,
Trophy,
Unique,
Wilson Earl,
H. M. S. Hunter,
Seneca,
President.

Under construction :—Two steamships for Dominion Coal Co ; One steamship, Chicago Shipbuilding Co.

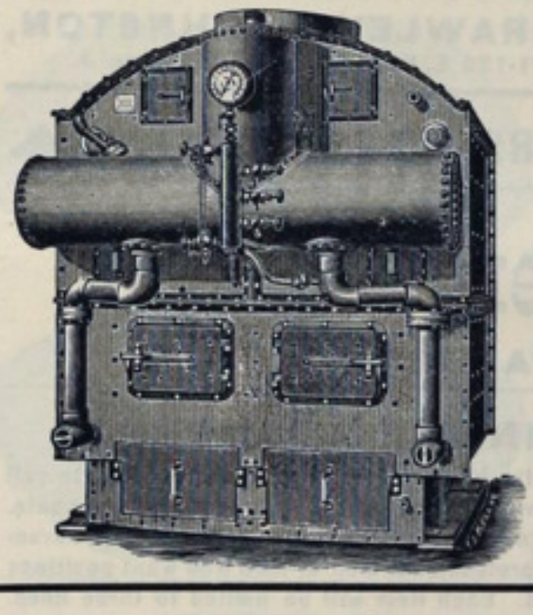
SHIP LAMPS.

OIL AND ELECTRIC FIXTURERS
FOR
Steamships, Yachts, &c.
GREAT VARIETY OF DESIGNS.
Prices and Cuts on Application.

PAGE BROS. & CO.,

(FORMERLY WILLIAMS, PAGE & CO.)

227 to 233 Cambridge St., BOSTON, MASS.



ALMY'S PATENT

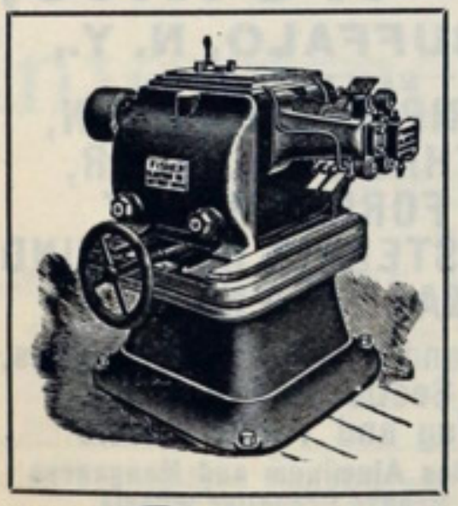
SECTIONAL

Water • Tube • Boilers.

NOW USED IN

18 Passenger Boats from 70 to 160 feet long.
27 Steam Yachts from 50 to 160 feet long.
U. S. Torpedo Boat "Stiletto."
Numerous Small Launches and Stationary Boilers are giving most excellent results.

ALMY WATER-TUBE BOILER CO.,
47 CLIFFORD ST.,
PROVIDENCE, R. I.



"Ninety per cent. of the Electric Lighting Plants on the inland lakes have been installed by the Fisher Co., of Detroit, Mich.

ALL THE GREAT FLEETS ARE EQUIPPED WITH OUR PLANTS.

Fisher Electrical Mfg. Co.

183-185-187 LARNED ST., W. Detroit, Mich.

F. W. WHEELER, President.
E. T. CARRINGTON, Vice-President.
F. L. GILBERT, Secretary.

F. W. WHEELER & CO.,
West Bay City, Mich.

Builders of all kinds of METAL AND WOODEN SHIPS.

AMERICAN CHAIN CABLE WORKS.
ESTABLISHED 1865.
Cable, Dredge, Quarry, Shipping, Crane and Rafting
CHAINS.
Our DREDGE and CRANE CHAINS are made of IRON ROLLED SPECIALLY for that purpose. Send for Price List.
J. B. CARR & CO., Manufacturers, TROY, NEW YORK.

THOS. DREIN & SON, TATNALL AND RAILROAD STS., WILMINGTON, DEL.

Builders of Metallic Life Boats and Rafts, Yachts and Pleasure Boats. Life Preservers. Outfit for Lake Steamers a Specialty.

THE "CINCINNATI" AUTOMATIC STEAM STEERING GEAR

A Simple, Powerful Machine. Noiseless and Sure.
SEND FOR CIRCULAR.
CRAWLEY & JOHNSTON, 119-121-125 E. Pearl St., CINCINNATI, O.

For BOLTS, NUTS, WASHERS, RIVETS Etc., Etc.
ADDRESS: Sternbergh & Son, READING, PA.

MARINE REVIEW LINER EXCHANGE.

Space under this heading may be used gratis by our advertisers or subscribers to call attention to vessels or any craft, machinery, new or second hand, that they may have for sale. Those wanting machinery of any kind or wishing to purchase vessels, are invited to take advantage of the same offer. Employers in need of professional men or men who want positions may avail themselves of the opportunities offered. Each item will be limited to three lines. Letters concerning same must mention number attached to item and be addressed MARINE REVIEW, 516 Perry-Payne Building, Cleveland, O.

284—FOR SALE—Passenger steamer Bon Voyage, and a tug with 5½ by 8 inch engine, boiler allowed 125 pounds steam.

285—WANTED—Position by a practical draughtsman and shipwright, experienced in details of ship construction and all kinds of naval architecture.

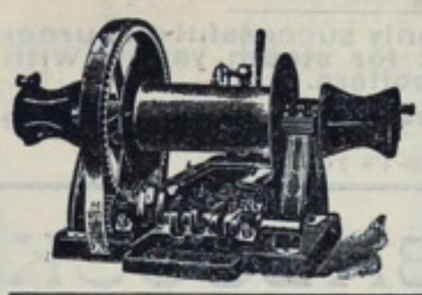
286—FOR SALE—Tug 60 feet long, 14 feet beam, 7½ feet deep; engine 16 by 18; steel boiler allowed 150 pounds; price $3,500.

287—FOR SALE—Two triple expansion engines, 6½, 10 and 16 by 10 inches, also a 5½ by 6 by 6 feet water tube boiler, allowed 200 pounds steam

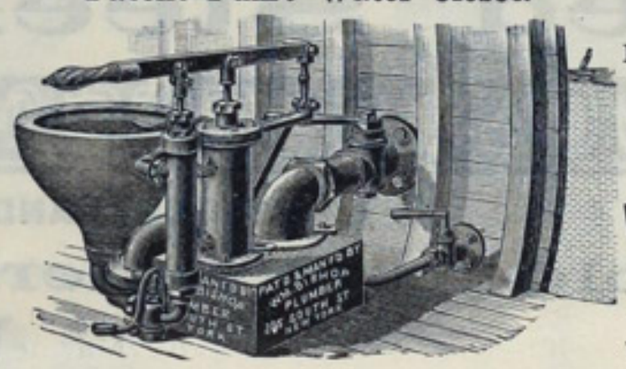
288—FOR SALE—Desirable dock property, suitable for a coal dock, at Racine, Wis.

289—WANTED Double drum hoisting engine and boiler.

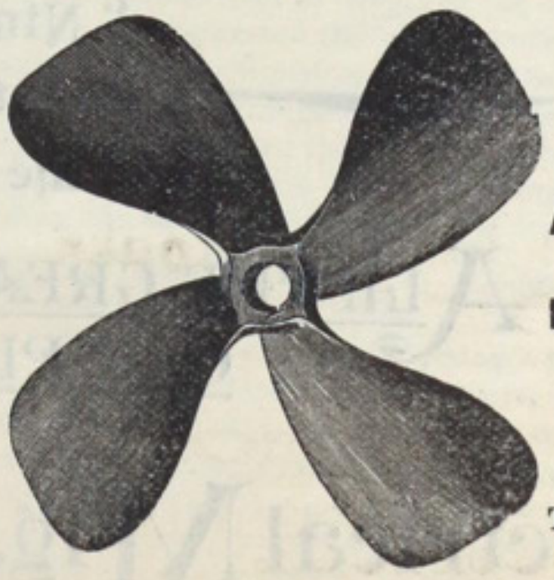
290—FOR SALE—Truss-built lighter, 115 by 26 by 6½ feet, 231 tons, oak bottom, white pine sides, used two seasons, cheap.



JACKSON & CHURCH,
Builders of DUPLEX HOISTING and DECK ENGINES.
Plain Finished and Automatic ENGINES, From Heavy Patterns at Moderate Prices.
Vertical, Horizontal, Marine & Locomotive BOILERS Strictly First-Class and Highest Test.
Send for Circulars and Prices. SAGINAW, MICH.

Patent Pump Water Closet.

For Yachts, Pilot Boats, Naval Ships, Etc.
For above or below water line. In use on U.S. Cruisers New York, Columbia, and Battleships Indiana, Maine, Texas, Massachusetts, Etc. Our No. 4 can be put in a space 15 in. x 15 in.
WILLIAM BISHOP & SON,
205 South St., NEW YORK,
724 Third Ave., BROOKLYN.
Telephone 569 Franklin.
Yacht Fittings a Specialty.

The Martin-Barriss Co.
IMPORTERS AND MANUFACTURERS OF
Mahogany, White Mahogany,
AND ALL NATIVE CABINET WOODS.
HIGH GRADES OF KILN DRIED WOODS FOR CABIN WORK AND INSIDE TRIM.
White Oak Timbers and Plank
CONSTANTLY ON HAND AND SAWED TO ORDER ON SHORT NOTICE.
654 Seneca Street, Cleveland, Ohio.

H. G. TROUT,
KING IRON WORKS,
BUFFALO, N. Y.,
MANUFACTURERS OF
TRIPLE EXPANSION, THREE CYLINDER, FORE AND AFT And STEEPLE COMPOUND MARINE ENGINES,
High and Low Pressure Engines, Sectional, Propeller, Tug and Yacht Wheels,
Cowles Aluminum and Manganese Bronze Propeller Wheels.

These Wheels are noted for their extra speed, towing power and proportionate saving of coal.
PRICES QUOTED ON APPLICATION.

DIXON'S Grapite Pipe Joint Grease

Enables you to MAKE A TIGHTER JOINT than you can possibly make with red lead. You can do it easier, and parts can be separated at any time without breaking anything. Send for sample and circular.

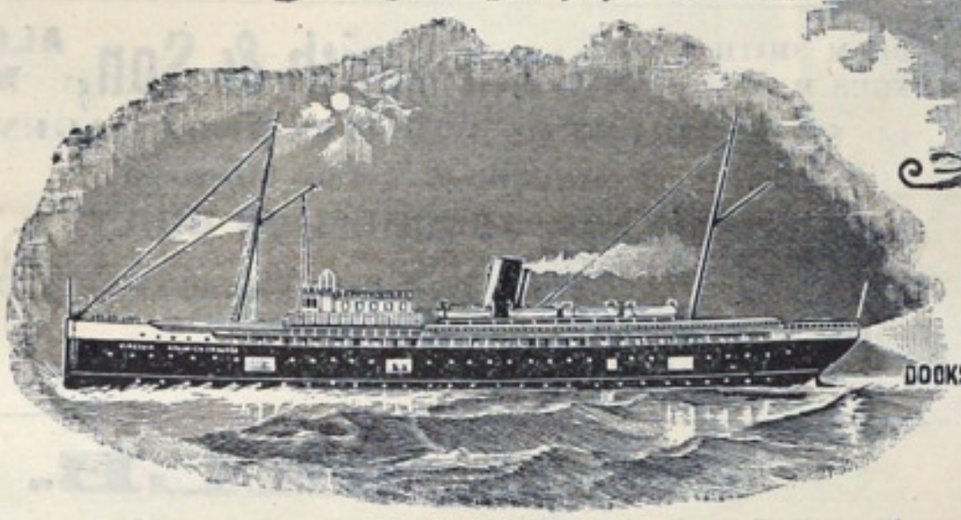
JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

DIXON'S Lubricating Graphite

Is fully explained in an INTERESTING AND INSTRUCTIVE PAMPHLET which is FREE to all interested. It will pay all Engineers and Machinists to SEND FOR IT.

JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

E. S. Richardson Fueling Co.



COAL

DOCKS { FOOT OF NORTH MARKET ST
18TH STREET BRIDGE.
ILLINOIS CENTRAL SLIP "C."

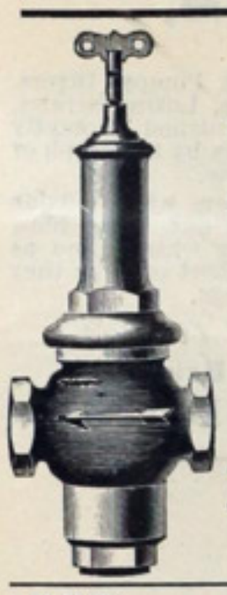
ROOM 7
METROPOLITAN BLDG.
CHICAGO.

"The man who knows so much about his profession that he cannot learn something about it by reading and study, has a very small profession or a very large cranium."

Marine and Mechanical Literature and Periodicals.

	Per Year
Nautical Dictionary, [Patterson]	$ 5 00
Nautical Dictionary and Marine Review	6 00
Engineering, [London], Weekly	10 00
Engineering, [London], Weekly and Marine Review	11 00
The Engineer, [New York], Semi Monthly	2 50
The Engineer, [New York], and Marine Review	4 00
Engineering, [New York], Monthly Magazine	3 00
Engineering, [New York] and Marine Review	4 00
American Shipbuilder and Marine Review	3 00
Emerson Binder, [that will hold 52 Nos. of the Marine Review]	1 00

MARINE REVIEW,
516 Perry-Payne Bldg., CLEVELAND, O.



THE MASON
REDUCING VALVE

Was adopted by the U. S. Naval Engineering board. It is the standard in the Danish and other foreign navies; also on the Pennsylvania and 120 other railroads. It is made to wear.

MASON REGULATOR CO.
BOSTON, MASS.

1880. 1893.

CHAS. H. POTTER & CO.,
Investment Bankers,
Cleveland, O.

Dealers in
Lake Superior Iron Mining Stocks,

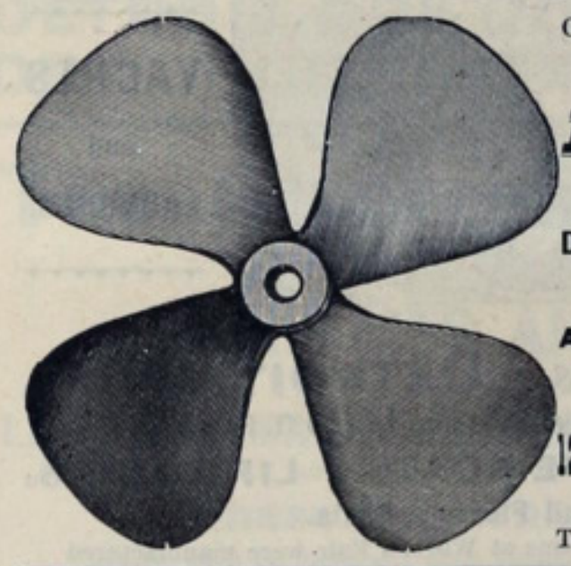
on about 10 per cent. annual dividend basis, Republic Iron Co., Lake Superior Iron Co., Champion Iron Co., Minnesota Iron Co., Jackson Iron Co., Cleveland-Cliffs Iron Co., Chandler Iron Co., Chicago and Minnesota Ore Co.

C. H. McCUTCHEON,
(Successor to SAMUEL McCUTCHEON.)
Copper, Tin and Sheet Iron Manufactory,
Steamboat and Engineers' Supplies.

All kinds of Brass Cocks, Globe Valves and Couplings, &c. Iron Pipe and Fittings, and Mill Supplies. Rubber Belting, Hose and Packings, Springs, Valves, &c., Leather Belting and Usudurian Packing.

Telephone No. 68. **No. 18 Ohio Street, BUFFALO, N. Y.**

SHERIFFS MANUFACTURING COMPANY,



C. STARKE, Pres. W. H. MEYER, V.Pres.
THOS. W. SHERIFFS, Manager.

MANUFACTURERS OF
MARINE :: ENGINES,
PROPELLER WHEELS,
Dredge Machinery of Latest Design.
MARINE REPAIRS AT ALL HOURS.
Agents for Marine Trade for
BANCS' OIL CUPS.

124, 126 128, 130 & 132 Barclay Street,
MILWAUKEE, WIS
Telephone 163. Corresponpence Solicited.

FOR SALE CHEAP.

One Fore and Aft Compound Engine. Diameter of Cylinder 16½ and 32 inches by 25 inches Stroke. Open Front and Slipper Guide. Built from drawing made by Navy Department at Washington, D.C. Duplicate of a set built and put in U. S. R. Steamer "Calumet." Suitable for any kind of Marine or Stationary use, such as Tug Boats, Excursion Steamers, Electric Power Plant, etc, etc. Now in course of construction, and will, when finished, look very handsome and be first-class.

Marine Engines, 14 x 14 inches and 14 x 16 inches. New and first-class in every respect. Patterns for all sizes of Marine Engines.

One Twin Screw Iron and Steel Yacht, 54 feet long by 10 feet beam by 5 deep. Nearly finished. Address, BELL'S STEAM ENGINE WORKS, Buffalo, N.Y.

PATENTS

Promptly secured. Trade-Marks, Copyrights and Labels registered. Twenty-five years experience. We report whether patent can be secured or not, free of charge. Our fee not due until patent is allowed. **32 page Book Free.**
H. B. WILLSON & CO., Attorneys at Law, Opp. U. S. Pat. Office. **WASHINGTON, D.C.**

"ROPER'S LAND AND MARINE ENGINES," BOUND IN MOROCCO WITH FLAP AND POCKET, WILL BE MAILED TO ANY ADDRESS FOR $3 50 SENT TO THE MARINE REVIEW, CLEVELAND, O.

THE Swain Wrecking Co.

E. M. PECK, Pres.

4 STEAM PUMPS, 10 JACKS, 3 HAWSERS.

3-12 INCH ROTARY.
1-14 INCH WORTHINGTON.

DIVING RIGS AND DIVERS ABOARD AT ALL TIMES.

10-100 TON JACKS.
1-12 INCH HAWSER
1-10
1-9

Telegraph
Capt. M. SWAIN.
CHEBOYGAN, MICH.

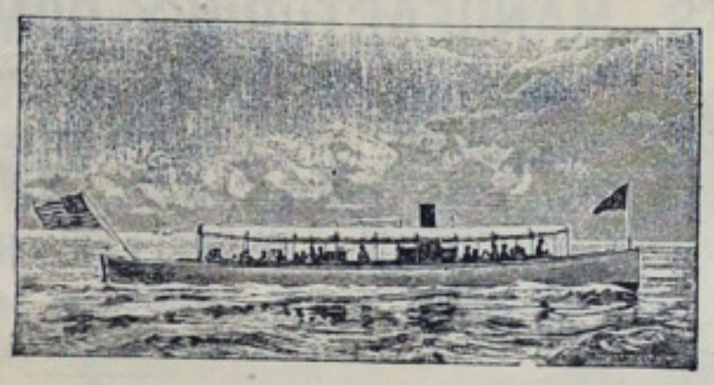
TELEGRAPH
PARKER & MILLEN.
DETROIT, MICH.

JENKINS' STANDARD PACKING. Our business is and has been for years, manufacturing a Packing that would stand in all positions and under all actions of steam and during that time it has never failed to make a perfect joint when properly applied. Under the increasing high pressure there never was a time when engineers needed a packing that would stand as they do to-day. Jenkins' Packing will do it.

WE GUARANTEE IT. JENKINS BROS., New York, Chicago, Philadelphia, Boston.

DETROIT BOAT WORKS.

STEEL and WOODEN



YACHTS and LAUNCHES.

BUILDERS OF *ELECTRIC LAUNCHES,* DETROIT, MICH.

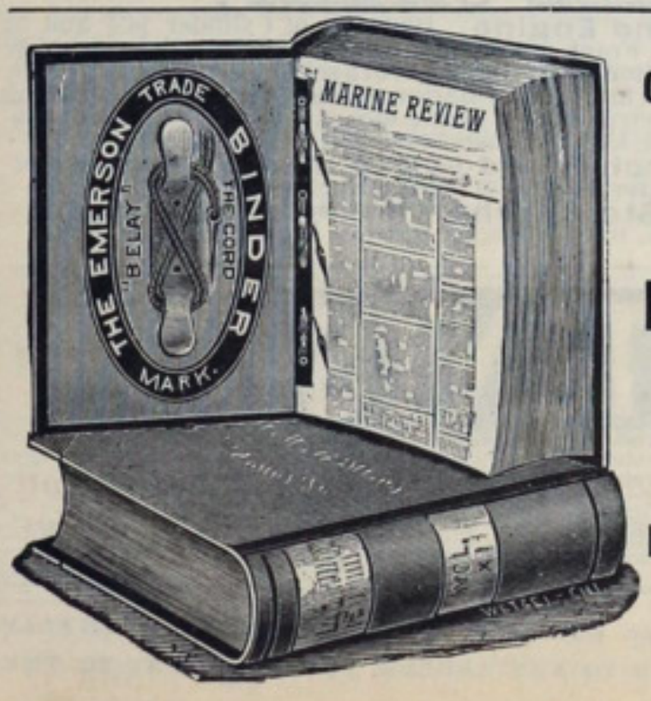
Any Class Wooden, Iron or Steel Boats up to 150 ft. in length.

YAWLS. METALLIC LIFE BOATS. LIFE RAFTS.

All kinds of Small Pleasure Boats.

The electric launches used on the lagoons at World's Fair were manufactured by this company.

Send for new illustrated Catalogue of electric launches.



ONE OF THESE BINDERS

that will hold 52 NUMBERS of the

MARINE REVIEW,

Will be mailed to any address on receipt of $1.

MARINE REVIEW...

516 Perry-Payne Bldg., CLEVELAND, O.

The Bertram Engine Works Co.

(LIMITED.)

ENGINEERS AND SHIP BUILDERS.

MARINE ENGINES AND BOILERS.

STEEL AND COMPOSITE

STEAMERS, TUGS and YACHTS.

ROBERTS AND MOSHER SAFETY WATER-TUBE BOILERS.

Office and Works: Niagara & Bathurst Sts., TORONTO, ONT., Ship Yard: Foot of Bathurst St.

ABRAM SMITH. ANGUS M. SMITH. **Abram Smith & Son,** ALGONAC, MICH.

SHIP BUILDERS AND STEAMBOAT AGENTS.

Agents Star-Colo Line Steamers.

SHIPS OF ANY DESCRIPTION BUILT...

SEND FOR PRICES and SPECIFICATIONS.

GOOD YARDS AND MILLS.

HULL FOR STEAMER FOR SALE.

FOR SALE.

1 Tug, in first-class condition,
20 x 22 Engine,
Boiler three years old,
130 pounds steam.

— ALSO —

1 Flat Scow, 88 cords stone capacity.
1 Flat Scow, 40 cords stone capacity.

Enquire of SHERIFFS MFG. CO., Milwaukee, Wis. To be sold together

P. M. CHURCH & CO.,

SAVINGS BANK BLOCK, SAULT STE. MARIE, MICH

LEADING DEALERS IN

Ship Chandlery,

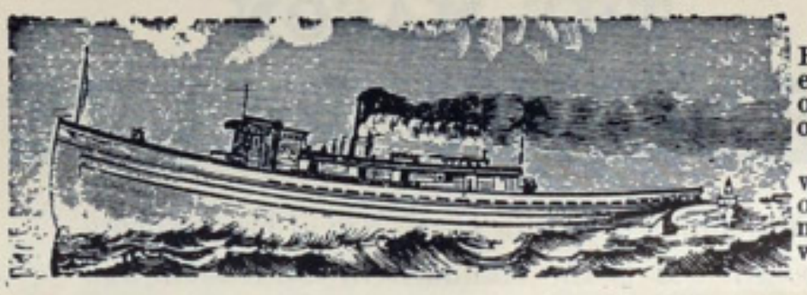
Marine Hardware, Paints, Oils, Packings, Cordage, Etc.

FIRST-CLASS COPPERSMITH AND TINSHOP IN CONNECTION.

H. A. HAWGOOD, President. PHILIP MINCH, Vice-President. GEO. ELSEY, Jr., Gen. Mgr. J. A. SMITH, Sec'y. J. R. SPRANKLE, Treas.

The Cleveland Tug Co.

FIRST-CLASS TUGS,

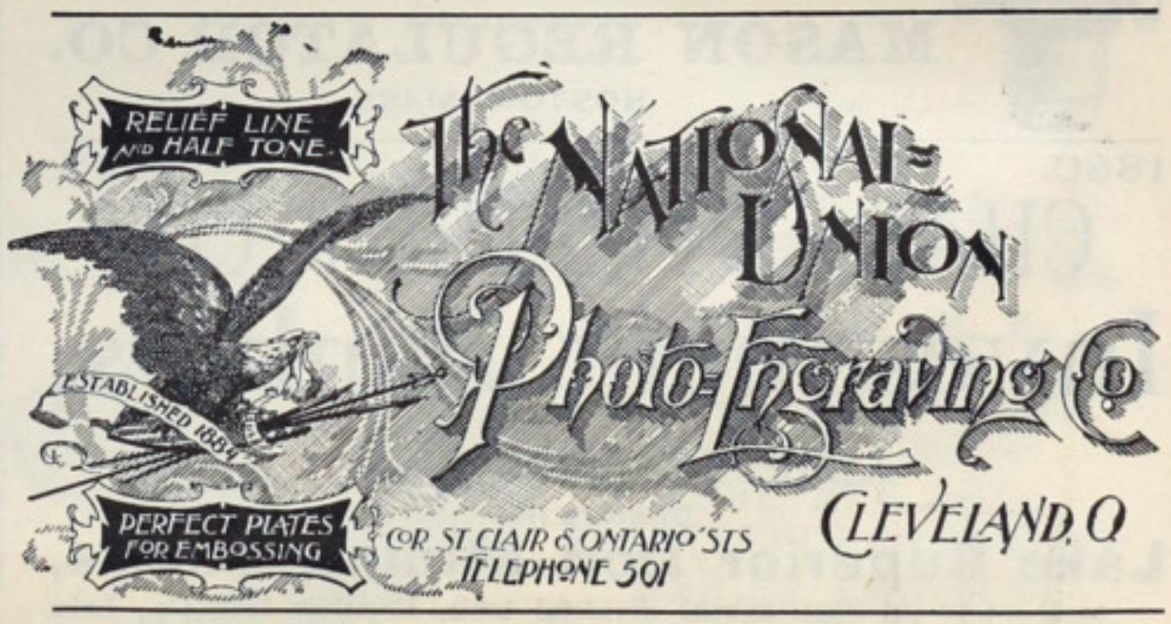


Steam Pumps, Divers, Hawsers, Lifting Screws, etc., furnished promptly on orders by telegraph or otherwise.

Steamers when outside wanting our Tugs, blow one long whistle and as many short ones as they want Tugs.

Office, Open Day or Night, East End Main St. Bridge,

Long Distance Telephone 919. CLEVELAND, OHIO.



DO YOU? *attach importance to the economy that reaches down to touch the* smaller items *of your Expense Account? True, it may perhaps involve only a* few dollars *in any one year, but in the selection of your* STEAM PACKING, *you can make those* "few dollars" still fewer *by confining your purchases strictly to the best made, viz.:* Genuine "Eureka" Steam Packing. *Send for Sample to* HINE & ROBERTSON, 40 Cortlandt Street, New York.

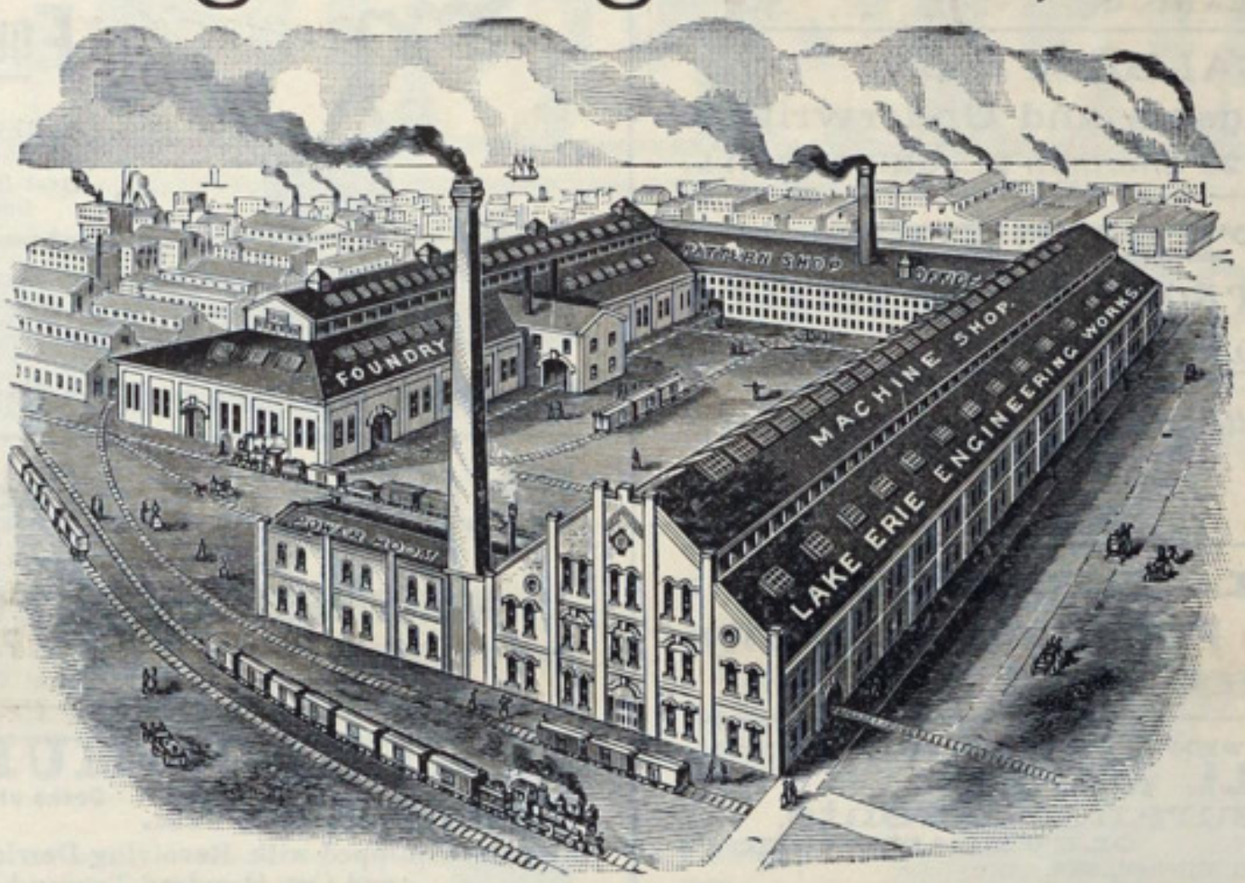
No. 8. *Our List of Prizes interests all Engineers.*

Lake Erie Engineering Works, Buffalo, N. Y.

RICHARD HAMMOND, Pres't.

JOHN COON, Sec'y and Treas.

Steam Engines, Compound, Triple and Quadruple Expansion Engines, From 250 to 10,000 Horse Power For Marine and Stationary Service.



Special Designs for Cable Railways and Electric Power Plants.

The Best Economy and Regulation Guaranteed.

THE BEST EQUIPPED PLANT IN AMERICA.

TO WHOM IT MAY CONCERN:

With the belief that no one would maliciously infringe the patent right of others, and with the hope that by calling Lake Steamship Owners' attention to the fact, that we own exclusively what have been commonly known as the HOWDEN HOT DRAFT PATENTS, they will not either be persuaded that these can be ignored or induced to put in apparatus misrepresented to be what we exclusively own.

We own the right to manufacture, sell and apply this system to the Great Lakes, the St. Lawrence, the connecting waters, and all territory adjacent thereto. And further, can apply the system to ships built by us for the Atlantic or Pacific Oceans.

To the manufacturers of infringing apparatus, we only wish to say that we will protect our rights, and warn them that it will be done diligently.

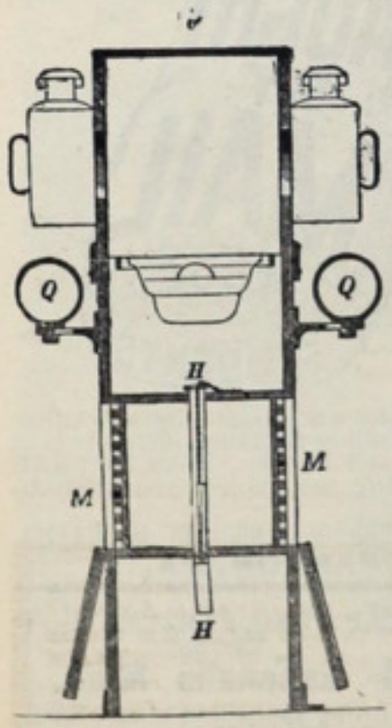
DETROIT, MICH.

DETROIT DRY DOCK COMPANY.
DRY DOCK ENGINE WORKS.

PATENT ADJUSTABLE

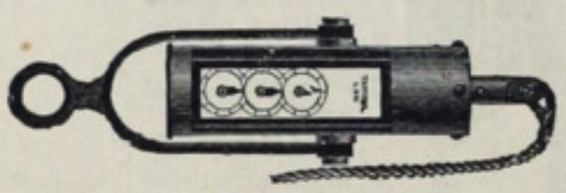
BINNACLE and COMPASS

FOR PILOT HOUSES.



With Directions for Adjustment.
SEND FOR CIRCULAR.

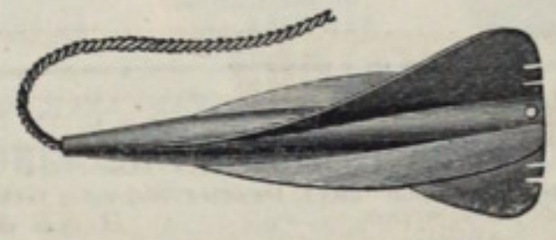
..TAFFRAIL LOG..



WITH ADJUSTABLE ROTATOR.

BEST LOG IN THE MARKET.

THOUSANDS IN USE.



MANUFACTURED BY

JOHN BLISS & CO., 128 Front Street, NEW YORK.

The Chase Machine Co.

111 ELM ST., CLEVELAND, O.,

...MACHINISTS AND ENGINEERS...

MANUFACTURERS OF

LAND AND MARINE ENGINES and STEAM PUMPS,

SOLE OWNERS AND MANUFACTURERS OF

Chase Fog Whistle Machine.

Over 150 in use on the best class of Lake Steamers.

Special Attention given to Marine Repair Work.

ENGINEERS' SUPPLIES.
ASBESTOS PIPE AND BOILER COVERING. TELEPHONE 994.

An Opportunity for ENGINEERS!

Two Indicators for Sale Cheap.

THOMPSON LATEST IMPROVED, with six extra springs —warranted good as new—used only a few times— It is worth $115—our price $70.

Calkins Steam Engine Indicator, Planimeter, Pantograph extra springs, and three way cock—full outfit for taking indicator cards — regular price $40 — our price $35.

MARINE REVIEW,
516 Perry-Payne Bldg., Cleveland, O.

HARVEY D. GOULDER,
LAWYER AND PROCTOR IN ADMIRALTY,
CLEVELAND, O.

W. H. COOK.
CAPT. J. A. CALBICK.
J. B. CLOUGH.
COOK, CALBICK & CO.
Vessel Agents and Underwriters.
Tel., Main, 56. RIALTO BLDG., No. 23 Sherman St., CHICAGO, ILL.

H. R. SPENCER,
ATTORNEY AT LAW and PROCTOR IN ADMIRALTY.
218 Superior St., DULUTH, MINN.

C. E. KREMER, *Attorney and Counselor-at-Law and Proctorin Admiralty.*
Rooms 14, 15 and 16, Bryan Block, - - 164 La Salle St., CHICAGO, ILL.

HARVEY L. BROWN,
Attorney at Law and Proctor in Admiralty,
Buffalo, N. Y.

JOHN MITCHELL. JOHN F. WEDOW. ALFRED MITCHELL.
MITCHELL & CO.,
Vessel and Insurance Agents,
508, 509 and 510 Perry-Payne Building, CLEVELAND, OHIO
Office Telephone, 737. Reidence, John Mitchell, 3506.

C. R. JONES & CO., VESSEL AGENTS,
FIRE AND MARINE INSURANCE.
Nos. 501, 502 and 503 Perry-Payne Bldg., CLEVELAND, O.

W. M. HAYDEN,
Lawyer and Proctor in Admiralty,
Depositions and Testimony
Taken as a Notary or under a commission. Legal business and collections promptly attended to.
1007 Soc. for Sav. Bldg., CLEVELAND, O.
Telephone 2297.

C. A. Macdonald. J. J. Rardon.
C. A. MACDONALD & CO.
General Insurance Agents,
RIALTO BUILDING, CHICAGO, ILL

H. S. LORD. J. H. NORTON.
LORD & NORTON,
Attorneys-at-Law,
Proctors and Advocates in Admiralty,
DULUTH, MINN.

White, Johnson & McCaslin,
ATTORNEYS-AT-LAW,
—AND—
Proctors in Admiralty,
26-27 Blackstone Building,
CLEVELAND, - OHIO.

THOS. WILSON,
MANAGING OWNER
WILSON'S TRANSIT LINE.
Gen. Forwarder.
Freight and Vessel Agent.
CLEVELAND, O.

C. F. Palmer. H. W. Cook.
Capt. J. A. Calbick.
Palmer, Cook & Calbick,
Vessel Agents and Underwriters,
108 and 109 Royal Insurance Bldg., Chicago, Ill.
Telephone, Harrison 698.

W. A. HAWGOOD, C. C. CANFIELD.
HAWGOOD & CANFIELD,
Vessel Agents and Marine Insurance,
604-605 Perry-Payne Bldg.,
Cleveland, - Ohio.
Telephone No. 2395.

ORESTES C. PINNEY,
Lawyer and Proctor in Admiralty.
Rooms 722 and 723 Perry-Payne Bldg.
CLEVELAND, OHIO.
Telephone 2585.

ISAAC N. HUNTSBERGER,
ATTORNEY-AT-LAW,
—AND—
PROCTOR IN ADMIRALTY,
TOLEDO, OHIO.

E. T. HITCHCOCK,
Average Adjuster,
184 Main St.,
BUFFALO, N.Y.

H. J. WEBB & CO.
SHIP BROKERS, VESSEL OWNERS and AGENTS,
Established in 1856. H. J. Webb & Co. will charter vessels for the lake trade. Special attention given to chartering vessels in the Lake Superior Iron Ore trade, both for the season and single trip.
No. 606 & 607 Perry-Payne Building, Cleveland, O. Office Telephone No. 338, Residence No 3228.

J. T. ROSE. FRANK B. LAZIER.
ROSE & LAZIER,
Vessel Agents and Brokers, and Marine Insurance,
16 Board of Trade,
DULUTH, - - MINN.

Established 1857.
THOMAS MARKS & CO.,
Merchants,
Forwarders and Shipowners,
Port Arthur, Canada.
N. B.—Special attention given to chartering vessels.

Capt. LYMAN HUNT. JAMES P. HUNT.
L. HUNT & SON,
Vessel Brokerage & Marine Insurance,
Room 9, Exchange Building.
Telephone No. 522.
No. 202 Main St., BUFFALO, N.Y.

U. S. ENGINEERS OFFICE, Hickox Building. 185 Euclid avenue, Cleveland, Ohio, Feb. 6, 1895. Sealed proposals for excavating channel at Ash.abula Harbor, Ohio, will be received here until 2 o'clock p. m., standard time, Wednesday, March 6, 1895, and then publicly opened. All information furnished on application toJARED SMITH, Lt. Col. Eng'rs. Mar 1

Pickands, Mather & Co.,

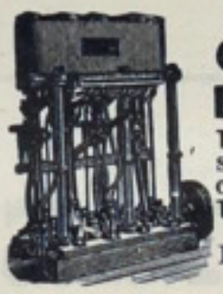
FUEL LIGHTERS AT BUFFALO, ERIE, ASHTABULA AND CLEVELAND.
At DETOUR, MICH., A FUEL DOCK equipped with Shute capacity of 600 Tons.
Best Quality PITTSBURGH COAL furnished at any time during Day or Night.
Western Reserve Building, CLEVELAND, O.

Mullen-Gatfield Coal Co.
— DEALERS IN THE CELEBRATED —
MANSFIELD AND YOUGHIOGHENY COALS.
Docks at SANDWICH, ONTARIO, opposite the Fort at Detroit, with chutes for rapid fueling.
Elevated docks and derrick at AMHERSTBURG, ONTARIO.

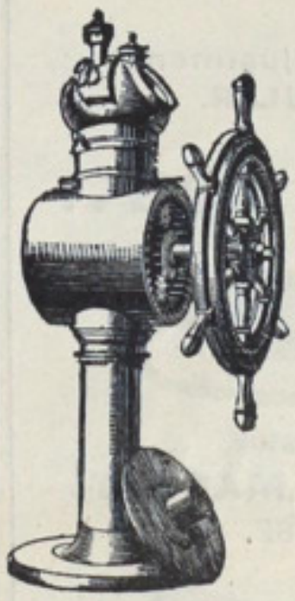
THE CUDDY-MULLEN COAL CO.
Dealers in COAL.
Docks at Government Pier, Whiskey Island, and Adjoining Globe Dry Dock.
All fully equipped with Revolving Derricks; also, Lighter Carrying Derrick and One Hundred Two and One-Half Ton Buckets.
Main Office, 81 Perkins Building, East Side of Main Street Bridge.
Dock Office, 127 West River St., Cleveland, O. Telephone No. 8.
Boats Coaled Day and Night. Docks at Amherstburg,

Ohio & Pennsylvania Coal Co.
FUEL DEPARTMENT.
MINERS AND SHIPPERS,
Youghiogheny and Ohio Steam Coals. Steamboats, Tugs, etc., Coaled day or night, Docks Foot West River Street. Whiskey Island Government Pier and C. & P. R. R. Slips. Also STEAM LIGHTER—Equipped with Revolving Derrick and (100) two ton buckets.
Telephone 1608. Office, 130 West River St., CLEVELAND, OHIO.

OFFICE OF LIGHT-HOUSE ENGINEER, 9th and 11th District, Detroit, Mich., Feb. 11, 1895. Sealed proposals will be received at this office until 3 o'clock P. M., on Saturday, the 2d day of March, 1895, for furnishing the boilers for ten steam fog signals, in sets of two, delivered at the light-house depot at Detroit, Michigan. Plans, specifications, forms of proposals, and other information may be obtained on application to the undersigned. The right is reserved to reject any or all bids and to waive any defect. M. B. ADAMS, Major, Corps of Engineers, U. S. A., Light-House Engineer.
14-21



STEAM YACHTS USE
Compound Engines
To Increase Power. and save one-third boiler capacity.
The Coulter & McKenzie Machine Co.,
P. O. Box 1127.
Bridgeport, Conn.



SNELLING'S PATENT STEERER
For Steamers, Ships, Tugs, Yachts, Coal Barges, Etc.
The drum has powerful internal gearing.
No Purchase Blocks needed.
Simple as the common "wheel and drum."
Powerful as any Screw Steerer.
An excellent relief or auxiliary gear for vessels that steer by steam.
Send for Circular.
J. H. SNELLING,
158 South Street,
NEW YORK.

STEAM ENGINEERING

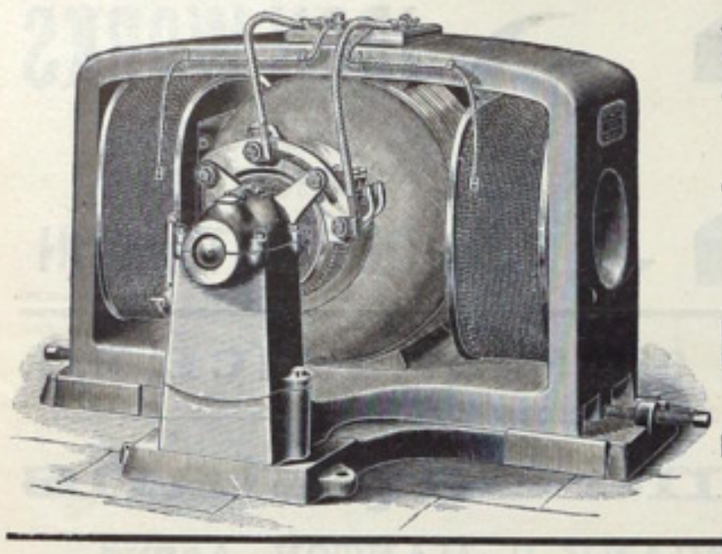
Diplomas Awarded. Courses in other trades, all including thorough instruction in Mathematics and Physics. Send for FREE circular, stating the subject you wish to study to
THE CORRESPONDENCE SCHOOL OF MECHANICS.
SCRANTON, PA.

H. A. BARR, President, Escanaba. F. H. VAN CLEVE, Sec. Escanaba. CAPT. GEO. BARTLEY, Supt. Escanaba.
ESCANABA TOWING & WRECKING CO., Escanaba, Mich.
Tugs, Lighters, Steam Pumps, Hawsers, Hydraulic Jacks and Diving Appliances always ready.
TUG MONARCH, Engine Compound, Cylinder 16 and 30 inches diameter, 30 inch. Stroke, Steam Pressure Allowed, 125 pounds.
TUG DELTA, Cylinder 20 by 22, Steam Pressure Allowed, 105 pounds.
TUG OWEN, Cylinder 20 by 20, Steam Pressure Allowed, 104 pounds.
CENTRIFUGAL PUMPS, Seven and Fourteen Inch Suction

S. F. HODGE & CO.

MARINE ENGINES,
PROPELLER WHEELS,
DECK HOISTERS,
MARINE REPAIRS.

320 ATWATER STREET,
DETROIT, MICH.



Electrical Supplies
—FOR—
..STEAMSHIPS..
A SPECIALTY.

The F. P. Little
Electrical Construction
and Supply Co.
No. 135 E. Seneca Street,
BUFFALO, N. Y.
Send for Catalogue.

Paint your Vessels with **L. S. G. Graphite Paint.**

NO BLISTERING, CRACKING OR SCALING.

Made especially for Stacks, Decks, Sides, Hulls and Water Compartments. Strictly anti-rust, and most durable and economical.

DETROIT GRAPHITE MFG. CO., 541 River St., Detroit, Mich.

—THE—

Bethlehem Iron Company

PRINCIPAL OFFICE and WORKS:

SOUTH BETHLEHEM, PENNA.

Steel Rails, Open Hearth, Bessemer and Nickel Steel Billets and Forgings.

Hydraulic Forged Shafting, Hollow or Solid. Cranks, Rolls, Etc.

Rough Machined or Finished. **Fluid Compressed Steel.**

GUNS and ARMOR.

New York Office,
80 Broadway.

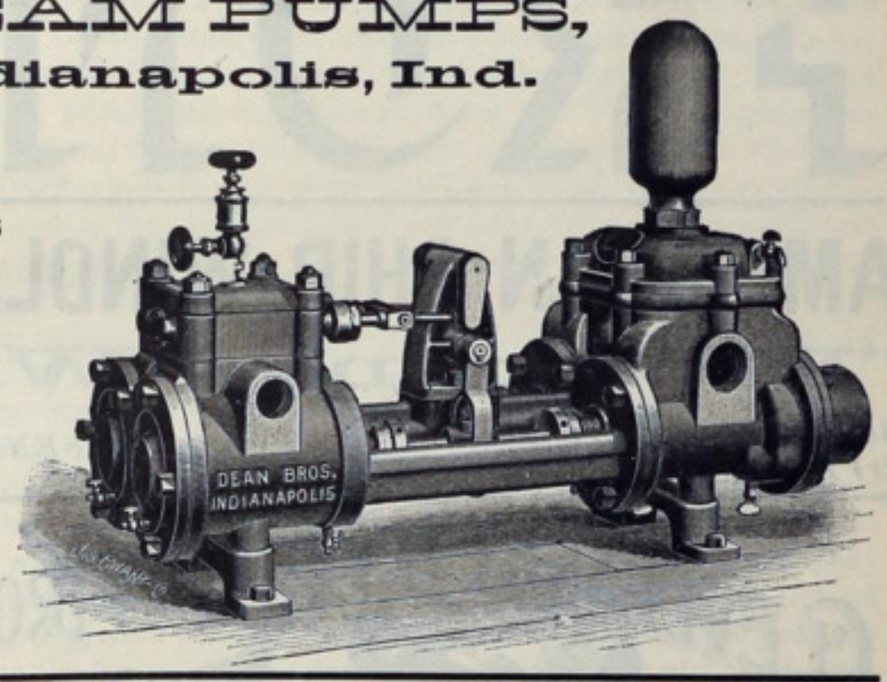
Philadelphia Office,
421 Chestnut St.

Western Agents, FISHER & PORTER,
1025 Monadnock Building, - Chicago, Ills.

DEAN BROTHERS,
STEAM PUMPS,
Indianapolis, Ind.

Boiler Feeders, Air Pumps and Condensers, Ballast Pumps, Fire Pumps, Bilge Pumps.

SEND FOR CATALOGUE



JOHN HAUG,
Consulting Engineer and Naval Architect.

Ship and Engineer Surveyor Lloyds Register, London.
Plans, Specifications and Superintendence of Ships and their Machinery.
Specialties—Bulk Oil Vessels High Speed Yacht Engines, etc.

206 Walnut Place, Philadelphia.

MILWAUKEE BOILER COMPANY,
[Successor to R. Davis Marine Boiler Works.]

Manufacturers of Marine and Stationary Boilers, Smoke Stacks, Tanks, Etc.

MARINE REPAIRING SPECIALLY ATTENDED TO. | Open Day & Night. | OFFICE AND SHOPS, OREGON BET. BARCLAY & So. WATER STS.

L. McGREOR, Supt. MILWAUKEE. WIS. Telephone 742.

THE CONDIT FULLER CO.
CLEVELAND, OHIO.

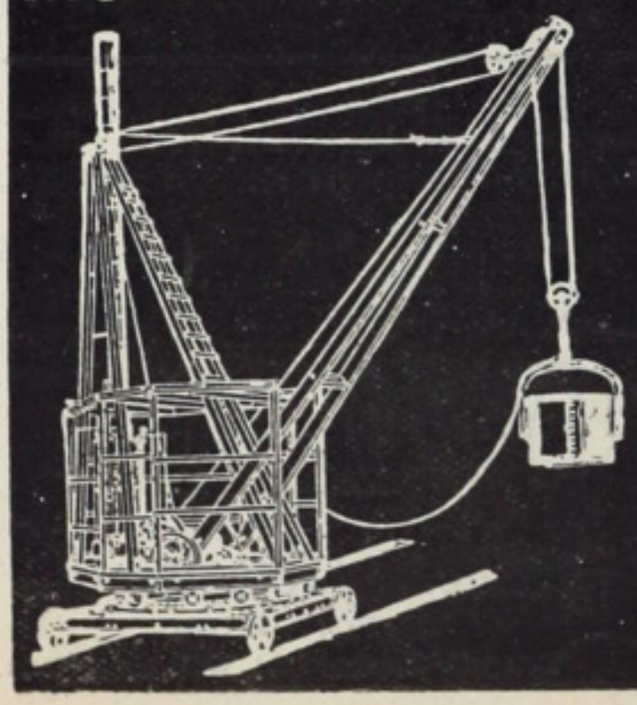
BAR IRON, SHEET IRON, PLATE IRON, PIG IRON,
BOILER TUBES, BOILER RIVETS, PLATE STEEL,
CLINCH RINGS, GAS PIPE, BOAT SPIKES, STEEL NAILS.

Sales Agents of
THE CARBON STEEL CO.
Manufacturers of
OPEN HEARTH STEEL,
SHIP PLATES, BOILER PLATES,
ARCHES and STRAPS FOR VESSELS A SPECIALTY.
Write for Prices and List of Sizes.

McMYLER MANUFACTURING CO., 180 COLUMBUS STREET, CLEVELAND, O.

SOLE MAKERS OF THE

McMYLER PATENT REVOLVING STEAM DERRICK

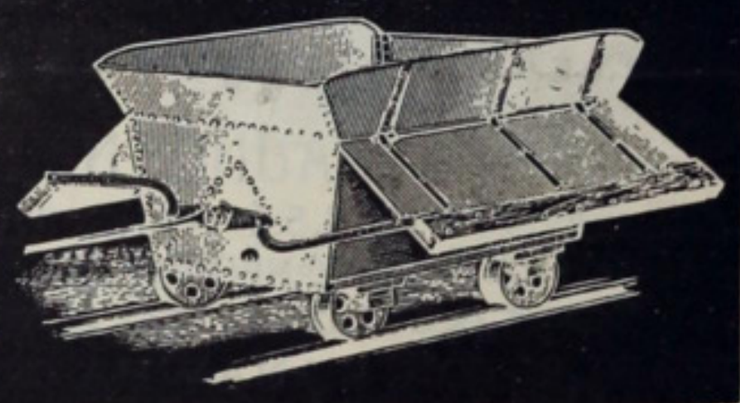


FOR HANDLING COAL, ORE AND COARSE FREIGHT OF ANY DESCRIPTION.

This Derrick can Lift Load, Alter the Radius of Boom, Swing in Either Direction at Will of Operator, and can Propel Itself on Track any Desired Distance.

BUILT FOR ANY CAPACITY WANTED

BUILDERS OF
CONVEYORS, COAL BUCKETS, ORE BUCKETS AND DUMP CARS.



COMPLETE ✻ ELECTRICAL ✻ INSTALLATIONS

For Steamships, Whalebacks, Yachts, Docks, Wharves, Etc.

DYNAMOS, WIRING APPLIANCES, WIRES, LAMPS, SEARCHLIGHTS, HOISTS, ETC, All of the Latest and Most Perfect Type.

GENERAL ELECTRIC COMPANY.

SALES OFFICES: { Schenectady, N. Y. Boston, Mass. | Chicago, Ill. Philadelphia, Pa. | Detroit, Mich. Baltimore, Md. | Buffalo, N. Y. Portland, Ore. | Columbus, O. San Francisco, Cal. | New York, N. Y.

FRONTIER IRON WORKS

MARINE ENGINES,
DETROIT, MICH

AMERICAN SHIP WINDLASS CO.

P. O. BOX 53, PROVIDENCE, R. I.

BUILDERS OF THE

"Providence" Windlasses and Capstans

350 STYLES AND SIZES. OVER 5000 IN USE. *SEND FOR CATALOGUE.* FRANK S. MANTON, AGENT.

CLEVELAND CITY FORGE & IRON CO.

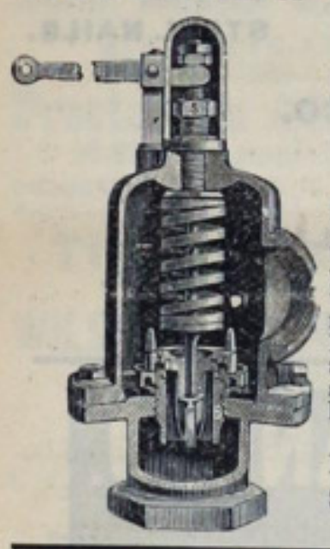
CLEVELAND, O.

IRON OR STEEL FORGINGS FINISHED COMPLETE, ROUGH MACHINED OR SMOOTH FORGED ONLY, OF ANY WEIGHT.
COUPLING LINKS AND PINS. PRESSED WROUGHT IRON TURNBUCKLES. CAR IRON SPECIALTIES.

CHAS. A. MOORE, Pres't. MARTIN LUSCOMB, Treas. GEO. W. RICHARDSON, Supt.

THE CONSOLIDATED SAFETY VALVE CO.,

MANUFACTURERS OF



The Only Nickel Seated POP Safety Valve

Approved by U. S. Board of Steamboat Inspectors. Adopted by U. S. Navy in all the Steel Cruisers.

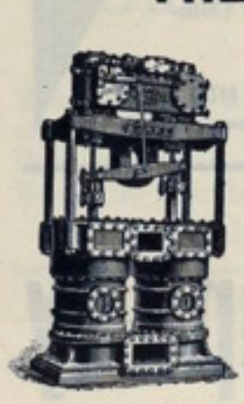
Consolidated Safety Valve Co. OFFICE
GENTLEMEN: *Babcock & Wilcox Co.*

The enclosed order for sixty (60) Nickel Seated Safety Valves is for the Spreckels Sugar Refinery, of Philadelphia. In looking over our books we find that, counting this order, we have used **1,725 of your valves** to date of the 3", 3½", 4", 4½" sizes, without a **single failure** to fulfill all the statements made by you when we bought the first valve in 1882. We could ask for **nothing better**, and the **absolute satisfaction** which they give to ourselves and our customers only proves once more that the highest priced goods are really the cheapest.

Yours truly, THE BABCOCK & WILCOX CO.
NAT. W. PRATT, Treas.

Salesroom, 111 Liberty St., N. Y.
WORKS, BRIDGEPORT, CONN.

THE GEO. F. BLAKE MFG. CO.



AIR PUMP ON U.S. CRUISER NEW YORK.

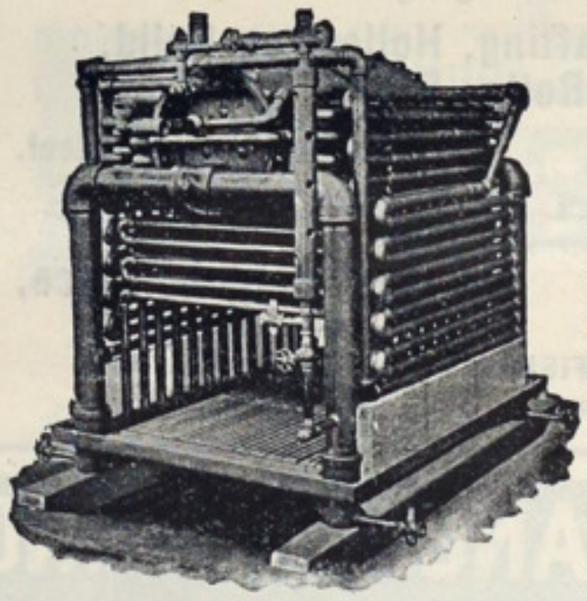
BUILDERS OF

MARINE PUMPS

Single and Duplex Pumps for Boiler Feed, Fire or Bilge Service—Vertical and Horizontal.
Vertical and Horizontal Pumps, Air Pumps for Surface and Jet Condensers.

95 and 97 Liberty St., NEW YORK.

The Roberts Safety Water Tube Marine Boiler,



For YACHTS, LAUNCHES and other Steamers.

THE ORIGINAL FIXED WATER LINE PIPE BOILER.

"Imitation the Sincerest Flattery."

We are collecting royalties from the customers of many infringers.

NEARLY 600 IN USE.

SAFE, RELIABLE, SIMPLE, LIGHT WEIGHT, ECONOMICAL, NO SHOP REPAIRS, SMALL SPACE. Send for ILLUSTRATED PAMPHLET and other reading matter, with hundreds of enthusiastic letters from purchasers and engineers.

— THE —

Roberts Safety Water Tube Boiler Co

Works covering 12,000 sq. ft. of ground at RED BANK, N. J.

39 & 41 Cortlandt St., NEW YORK CITY.

WARD BOILERS FOR STEAMERS LARGE OR SMALL

LIGHT WEIGHT, GREAT POWER

THREE TYPES.

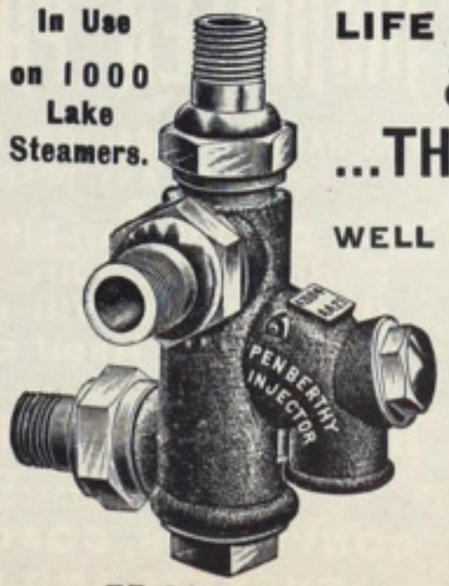
LAUNCH, NAVY AND MARINE.

ADOPTED BY U.S. GOVERNMENT. WAR VESSELS, LAUNCHES, REVENUE CUTTERS, TUGS.

AFTER THE MOST EXHAUSTIVE COMPETITIVE TESTS. Correspondence Invited.

CHARLES WARD,
CHARLESTON, KANAWHA CO., W. VA.

In Use on 1000 Lake Steamers.



75,000 IN USE.

LIFE AND PROPERTY ARE ENDANGERED BY THE USE OF **CHEAP BOILER APPLIANCES.**

...THE PENBERTHY STEAM SPECIALTIES

ARE **SAFE** BECAUSE **WELL MADE AND THOROUGHLY TESTED.**

PENBERTHY Automatic Injector, Valve Drip, Water Gauge, Safety Crank Pin Oiler, Etc.

SEND FOR CATALOGUE.

Penberthy Injector Co.

DETROIT, MICH.
Branch Factory at Windsor, Ont.